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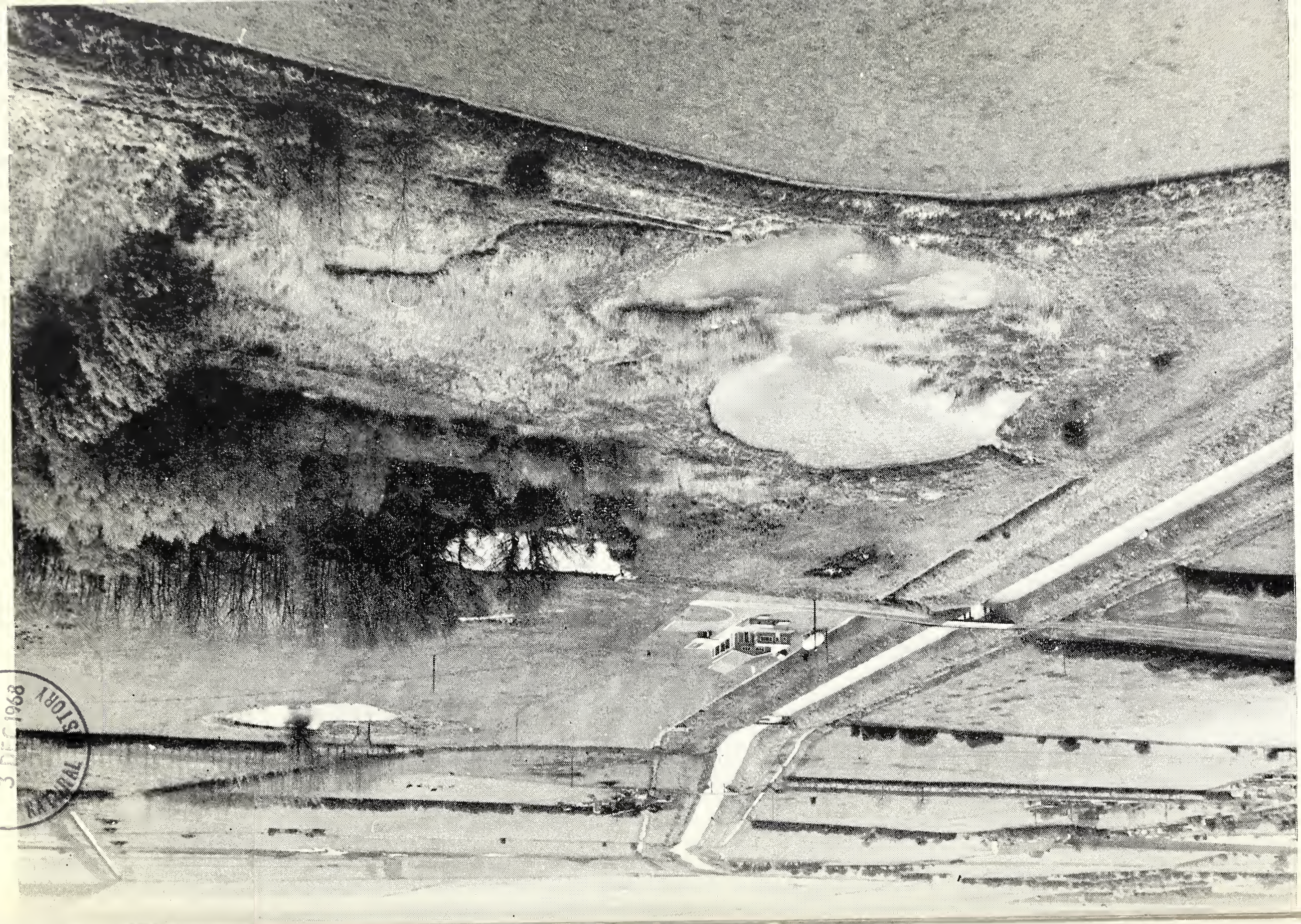


TETNEY BLOW WELLS

3 DEC 1968
SMITHSONIAN INSTITUTION
NATURAL HISTORY

LONG EARED BAT

(photo by M. Johnson, F.Z.S.)

Presidential Address

Delivered at Lincoln on 11th March, 1967
by
A. D. TOWNSEND, M.B.O.U.

THE BIRDS OF THE BARDNEY PONDS

Introduction

The Bardney Sugar Beet Factory settling ponds are situated alongside the south bank of the River Witham at Bardney near Lincoln. The area, totalling about 90 acres, consists of several man-made pools of various sizes. Over the years, by dredging and dumping, the banks of the ponds have been raised to a considerable height above the surrounding Nocton Fen.

During the sugar beet processing campaign, which usually lasts from September to January, water is taken from the river for washing the soil from the beet as it arrives at the factory. This dirty water is then circulated into the ponds where the soil it contains is allowed to settle. By natural means the oxygen is replaced and over a period of months, the water gradually reaches a degree of purity. It is then either used again in the factory for washing beet or is further purified and returned to the river. This additional purification is accomplished by finally passing the water through a biological percolating filter — the end product cleaner than when it was first taken from the river.

As this process takes place, several of the ponds are emptied of water so that by mid-summer and throughout the autumn there are large expanses of mud. This provides suitable resting and feeding areas for migrant waders. By July lush vegetation covers the banks and margins of the drier pools providing cover for the smaller migrant birds such as warblers, buntings, chats, etc. At this time insects especially Diptera of the families *Culicidae*, *Chironomidae* and *Psycoda* — the latter associated with the biological filters — are in abundance. These insects, coupled with other forms of life in the water and exposed mud, must really be the main attraction for the migrant birds. It has been suggested that the ponds lie on a regular migration route. In the light of recent advances in the study of bird migration, however, this seems most unlikely. It has not even been proved that the river plays any part in guiding birds to the ponds, although further research may well provide evidence that this is true of certain gulls and terns.

During the years 1957 to 1966 a total of 156 species have been recorded at the ponds. In addition, four others showing characteristics of different races, *i.e.*, Water Pipit, White Wagtail, Blue-headed Wagtail and the Mealy Redpoll, have also been recorded. Twenty-seven of these may be classed as regular breeding birds at the ponds, and a further seven have bred, or attempted to breed, very infrequently. The remaining species are passage migrants or winter visitors.

Breeding population

Over the years the intensive recording of migrants has left little time for any detailed study of the breeding population. However, during a decade of watching at the ponds these birds have not gone entirely unrecorded.

Regular breeders:

Mallard, Shoveler, Tufted Duck, Mute Swan, Red-legged Partridge, Moorhen, Coot, Lapwing, Black-headed Gull, Woodpigeon, Skylark, Swallow, Sand Martin, Song Thrush, Blackbird, Reed Warbler, Sedge Warbler, Whitethroat, Dunnock, Pied Wagtail, Yellow Wagtail, Yellowhammer, Starling, Linnet, Reed Bunting, House and Tree Sparrow.

Not an impressive list, but what is more important is that, with the exception of (in recent years especially) the Black-headed Gull, none of these birds breed in any large numbers. This is most useful since it enables even the smallest influx of migrants to be detected immediately.

Amongst the regular breeding birds the small colony of Reed Warblers was always considered to be the most valuable asset at the ponds. Unfortunately, during the winter of 1965/66 their habitat, a small bed of reeds (*Phragmites*), was destroyed. Although a male Reed Warbler sang for some time during the following July and August, it failed to attract a mate. This was the first time in at least ten years that the species had failed to breed at the ponds.

Irregular Breeders:

Little Grebe, Shelduck, Teal, Pochard, Redshank, Common Tern and Meadow Pipit.

Of these, the Common Tern has usually been the least successful. The reason for this is that their eggs are always laid close by the steadily increasing breeding colony of Black-headed Gulls. The Little Grebe was only an intermittent breeder before the severe winter of 1963/64. Since that time no nest has been found. It is perhaps fair to say, however, that this may also be due to the changing conditions of the water levels and amounts of vegetation from year to year. This factor has also had its effect on the Shelduck, Pochard and Teal. On the credit side, the Meadow Pipit does show signs of increasing as a breeding bird. This is not only at the Bardney Ponds, but also in the Lincoln area. It certainly did not breed on the marsh at the Lincoln sewage farm ten years ago, but by 1966 at least six breeding pairs were to be found. Although the Meadow Pipit has not bred with any certainty on the ponds, for the last two years pairs have bred on one of the wide dyke banks close by.

Winter visitors

The winter population has been more carefully documented than the breeding one, the small size of the area making this relatively easy. From November to early March both numbers and species fluctuate considerably, the highest numbers occurring in the early part of the winter when food is most plentiful. As the sugar beet campaign proceeds, the level in the ponds rises as the water is pumped out from the factory, which leaves little, if any, exposed mud for waders, although there have been winter records of Common Sandpiper, Ruff, Knot, Dunlin and Little Stint.

Winter is mainly the time for flocks of Linnets, Greenfinches, Chaffinches, and sometimes Bramblings and Redpolls; parties of Bullfinches; numerous Meadow Pipits, Starlings, House and Tree Sparrows. This time of the year has also produced uncommon birds such as Red-necked Grebe, Whooper and Bewick's Swans, Long-tailed Duck, Smew, Merlin, Kingfisher, Rock Pipit, Great Grey Shrike, Dipper, Bearded Tit, Twite, Mealy Redpoll and even a small flock of Snow Buntings one year in a nearby field.

Perhaps the most unexpected winter visitor was a Yellow Wagtail on 29th November, 1964. Even more startling was that this bird survived several days of freezing fog and was last seen, seemingly in good condition, on 27th December — just four days before it could have been claimed as the first Yellow Wagtail in the British Isles for 1965.

Visible Migration

The study of bird migration has, over the last eight years, undergone great changes, mainly brought about by the use of radar. Recent intensive work on the visible passage of birds, both by radar and by ground observation, seems

to confirm the conclusions of the earlier radar workers. This is that the direction of flight observed from the ground is seldom any indication of where the birds are coming from or going to. It is also becoming increasingly evident that most migrants enter the British Isles in Spring on a general north-west heading and depart on a south-east heading in autumn, and that almost all this migration takes place at heights well beyond the range of most modern optical instruments.

If this is so, then what is the value of recording birds, thought to be on migration, at such a place as the Bardney Ponds? While the radar set has revealed the tremendous height at which the greater part of migration takes place, some birds fly low enough to be detected even without binoculars. They may do this because of adverse weather or because it is quite normal for birds like the Swift and certain of the hirundines such as the Swallow to fly low enough to be observed from the ground. Whatever the reason, there is great value in recording these birds, provided that the exact direction of flight, wind direction and strength, amount of cloud cover and the general weather conditions are also recorded accurately. It is then possible, on occasion, to correlate this information with, for instance, the coastal observatories' records, and by doing so add a little more to our knowledge of how migration takes place.

Unfortunately, neither the Swift nor the Swallow is a regular passage migrant in any numbers at the Bardney Ponds. In fact, the only species which, over the years, has given the appearance of performing a true migration by flying over the ponds in spring and autumn is the Turtle Dove and this is discussed later.

Other birds are often recorded flying over the ponds (*e.g.*, Woodpigeon, Terns, Skylark, Rook, Starling, Lapwing), but it is only exceptionally possible to suggest whether these movements are: 1. migration, 2. feeding movements, 3. movement due to local disturbance, 4. post-juvenile dispersal or 5. overshooting the breeding area (spring only).

It is very obvious that great care must be taken before interpreting what a bird is doing. It is especially dangerous to say that it is migrating, even though it may be flying in the right (or assumed right) direction at the right time of the year. While it may be difficult to determine whether a bird is migrating or not, several factors concerning certain birds at Bardney are worth considering. Almost all the movements considered to be migration take place with the birds flying into head winds and with overcast, or partially overcast, skies. These are just the conditions which usually produces negative results on the radar set — the birds are in fact flying below its range, although in smaller numbers and more often than not in a different direction to when they fly at the greater heights.

Low-level migration in Lincolnshire must, because of the topography of the county, take place on a broad front. There are no high hills or deep valleys along which the birds concentrate into a narrow stream. Yet on one or two occasions such a stream of birds has been recorded for a short distance at the Bardney Ponds. On 6th August, 1961 in a force six south-westerly wind and slightly overcast there occurred a heavy south-west passage of Sand Martins, Swifts and a few Turtle Doves. The birds were flying below 200 feet and within $\frac{1}{4}$ mile NE of Bardney they were on a very wide straggling front. As they approached the ponds, they converged into a stream roughly the width of the ponds. After passing over the area, some almost at ground level, they started fanning out again over Nocton Fen into a broad front movement. Similar behaviour has also been recorded at the sugar beet factory ponds at Spalding.

Is it possible that low-level migrants, even over flat terrain, require a focal point somewhere on their journey in order to keep them together in adverse weather conditions or even to maintain direction in the absence of sight of the sun? During October it is easier to say, with some certainty, that such birds as Lapwings, Thrushes, Finches and Buntings flying over the ponds are birds actually migrating. Usually these movements can be correlated with similar movements at the coastal observatories and are connected with the arrival of our winter visitors, and later in the winter with cold weather movements. With the exception of the Turtle Dove, the remaining species are those referred to as grounded migrants, *i.e.*, feeding or resting in the area of the ponds.

There is little evidence that the huge occasional falls of migrants — Pied Flycatchers, Redstarts, Warblers, Chats, etc. — along the east coast of Britain are reflected as far inland as Bardney except as occasional single birds. One wonders why, in view of modern thought on such migrants. If these birds, migrating from Scandinavia, can be grounded at the coast by fronts of low pressure moving north or north-eastwards over the North Sea, why should not the same conditions force them down further inland, at least on certain occasions? Is it possible that this in fact does happen sometimes? It could well be that away from the coast these grounded birds are so spread out as to be difficult to detect. This could explain the infrequent appearance of the Red-backed Shrike, Garden Warbler and Whinchat at Bardney when the weather conditions just described have occurred. It is an interesting fact, however, that both the Redstart and Pied Flycatcher are notable exceptions from the Bardney list. Yet, on the other hand, a Redstart was seen to fly southwards over the river at Southrey, a short distance down stream, one cloudy autumn morning.

There is far more evidence that during the autumn the small falls of such birds as Willow Warblers, Whitethroats, Sedge Warblers and Yellow Wagtails at Bardney are birds which have bred in Britain. These birds almost always appear following overcast skies and westerly winds, the same conditions which often produce similar small falls of the same species along the east coast. These are not linked with Scandinavian migrants but are doubtless British-bred birds leaving on their normal autumn migration and temporarily grounded by adverse weather.

It is not possible to deal at length with all the birds recorded at the Bardney ponds. I have, therefore, restricted discussion to the occurrence of the Dipper, Turtle Dove, Marsh Warbler, Meadow Pipit and several species of waders.

Dipper

On 16th November, 1963 a female Dipper flew through an open office window at the factory. Unfortunately it struck a wall and subsequently died. On handling the bird I was unable to find any trace of chestnut on the lower-breast, flanks or belly, these areas being dark brownish black, and unhesitatingly I identified it as belonging to the nominate race *Cinclus cinclus cinclus* the Black-bellied Dipper. Apart from several unsatisfactory records, the last in 1905, this particular race had never been recorded in the county. I was pleased, therefore, when Mr. R. Wagstaffe of the Liverpool Museum offered to examine the specimen critically. He compared it with specimens in his own collection, and later Dr. C. J. O. Harrison did the same with the series in the British Museum. Both found that the Bardney bird was much darker than even the nominate race and, quite independently, came to the conclusion that it was a melanistic variation and as such could not be racially identified. Wagstaffe did suggest, however, that this was only a tentative conclusion and further comparison with fresh material may change his view.

The specimen was then kindly examined by James Alder who, even with his vast experience of Dippers, also found the Bardney bird quite a problem. Alder had found that dark birds (showing no chestnut in the field and mainly 1st winter females) even occurred in Northumberland. His final conclusions on the Lincolnshire bird were as follows:

"1. On the basis of the improbability, but not impossibility, of a British bred female Dipper (perhaps from Derbyshire) moving so far downstream and eastwards, and the fact that birds of the nominate race, including females, do migrate regularly, this bird may well be *C. c. cinclus* and 2. On the basis of the many dark birds encountered in the field, where binoculars have failed to reveal any chestnut band, I would treat all sight records of the Black-bellied Dipper with caution, and refuse them if they occurred within typical breeding areas."

These conclusions must also throw doubt on the record of a bird showing the characteristics of *C. c. cinclus* at Tealby during February and March, 1964. It has been suggested that almost any Dipper recorded near the east coast of Lincolnshire in winter must be from Scandinavia. This is because birds of the British race do not move any appreciable distance from their breeding grounds (the furthest recorded by Alder was in fact 30 miles). On the other hand this can hardly be so when a typical British Dipper occurred on the River Lud near Louth during five successive winters, 1951 to 1955, and again in 1964. Taking all these facts into consideration Lincolnshire is still without a satisfactory record of a Black-bellied Dipper.

Meadow Pipit

The Meadow Pipit is an abundant spring and autumn passage migrant on both the east and west coasts of Britain, and there is strong evidence that the west coast passage is of birds from Iceland. In 1959 Ken Williamson, then Migration Research Officer of the British Trust for Ornithology, suggested that all the observatories could investigate this problem of Meadow Pipit migration by closely examining all grounded Meadow Pipits considered to be migrants.

The name *Anthus pratensis theresae* was given by R. Meinerzhagen to Meadow Pipits with richer brown upper-parts and pinker buff underparts than the nominate race which dominate the west coast passage. *A. p. theresae* certainly breeds in Iceland and is most probably the bird of Highland Britain. In view of this the adoption of the name 'Atlantic' Meadow Pipit is considered valid, although *theresae* is the prior name for birds of this type. (*K.W. in litt*).

Apart from odd pairs present in the area of the Bardney ponds during the summer, the Meadow Pipit is only recorded there in any numbers from September and throughout the early part of the winter. Examination of the Bardney logs does, however, reveal that these birds arrive at two distinct times in autumn and early winter.

The first peaks occur early in September and continue until the first week of October. The second arrival is in mid-November and is on a much smaller scale. These facts were available in 1964 when it was decided in future years to examine critically all grounded meadow pipits in autumn and winter with the following results. Roughly 85% of the September arrivals were of the darker, richer-plumaged birds, while those present from mid-October, together with the November peak, were almost exclusively birds of the nominate race *A. p. pratensis*. Without trapping, these results can hardly be conclusive. It would appear, however, that, providing *A. p. theresae* can be satisfactorily separated in the field, both races do occur at the Bardney ponds in autumn.

Another interesting fact emerging from the Bardney records is the manner in which these peaks occur (Fig. 1). In September as many as five different arrivals are indicated. At first glance this suggests a bias towards weekend

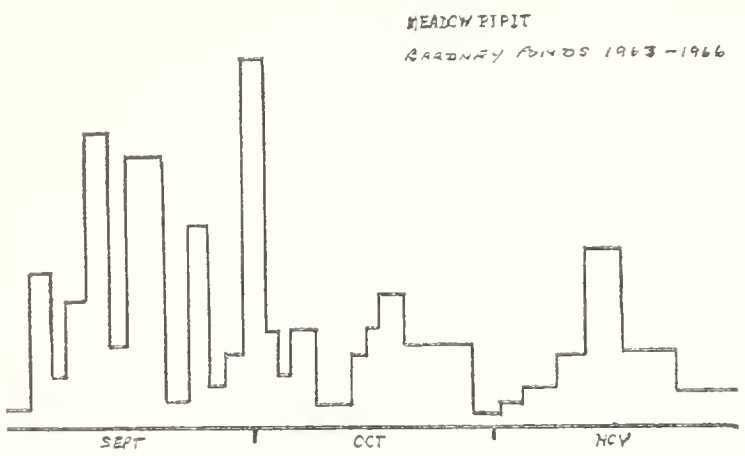


Fig. 1.

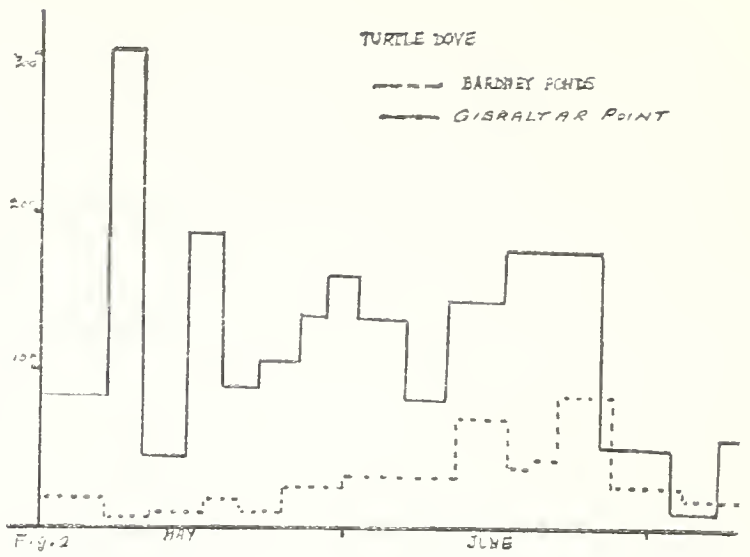


Fig. 2

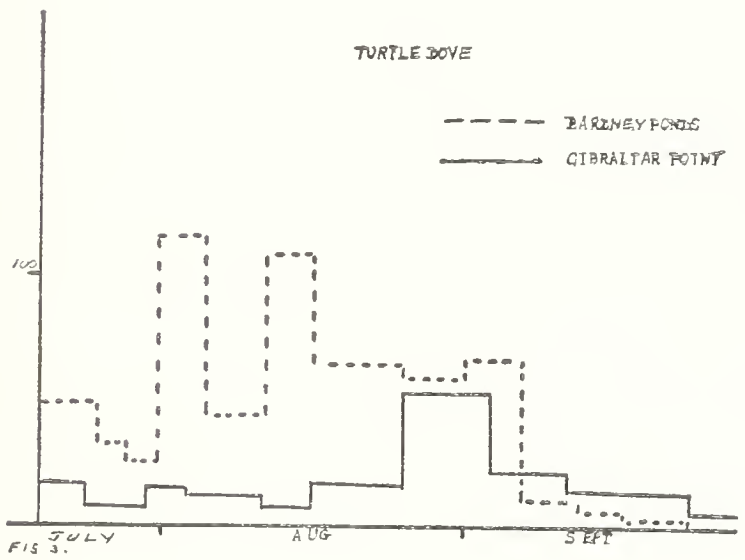


Fig 3.

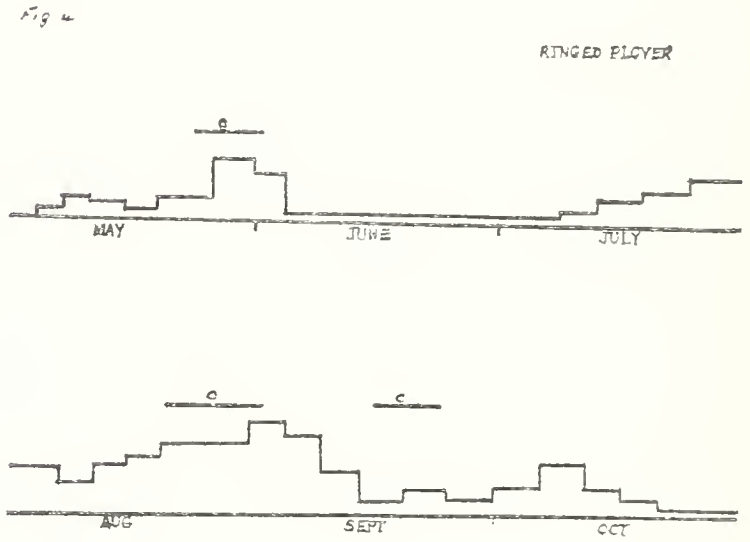


Fig 4

visits by observers. At this time of the year, however, the area is counted practically daily, and this rapid fluctuation surely indicates a movement through the area. On the other hand the November peak is more gradual and is indicative of the main arrival of the wintering population. These numbers slowly decrease until, by early December as food becomes scarcer, the normal winter level of approximately twenty birds is reached.

That the 'Atlantic' bird is not exclusive to the west coast of Britain on passage is also evident at Gibraltar Point, where in 1965 and again in 1966, examples of this darker race were caught and examined. It is natural to suppose that those birds breeding in Iceland will migrate down the west coast of Britain. Therefore those birds moving through Bardney in September/October, may well be from the Scottish Highlands and the Pennincs.

Before leaving the passerines I think it is only fair to make a short reference to perhaps the most notable bird ever to appear at the Bardney ponds — the Marsh Warbler. Rather an insignificant little 'brown job' to be given such priority, yet it was this particular bird, and its subsequent effect on an unmated Reed Warbler, that caused G. A. Pyman to write in *British Birds* in 1965 that it "served to draw attention to what virtually amounted to a gap in the literature". I do not intend here to relate the full story. Suffice to say that it at least helped to prove that Reed Warblers can, under certain conditions, show more mimetic powers than was hitherto recognised.

There is a remarkable sequence to this story. Earlier I referred to the solitary Reed Warbler which sang for a period during the summer of 1966. At first the song was quite normal and showed little variation from the familiar 'chirruc chirruc' — 'jag jag jag' song of the species. Some weeks later the bird had still not been successful in attracting a mate and by now the song was interspersed with the calls of several other species including the alarm note of the Blackbird and the 'chipping' notes of both House and Tree Sparrow. By late August the only occasion when the bird sang or called 'normally' was when it was alarmed — further evidence of the Reed Warbler's vocal versatility, although on this occasion the result of frustration rather than direct mimicry.

Turtle Dove

The Turtle Dove is the only species which over the last ten years, has, conformed to any pattern in flying over the ponds in spring and autumn. Comparisons have been made with the records at three coastal observatories: Spurn Point, Tetney and Gibraltar Point. This has revealed that the Turtle Dove is a much commoner migrant at the coast in spring than it is inland, especially towards the end of May (Fig. 2). In the autumn, however, the picture is reversed (Fig. 3), with by far the larger numbers appearing at the inland station.

As with all migratory problems things are never, or rarely, as they seem. In the light of such evidence it would be easy to say that the Turtle Dove migrates along the coast in spring and departs inland during the autumn. This is far from the truth, although it is only possible to make an educated guess as to what is really happening. The following may be somewhere near the truth.

It is important to note that the majority of Turtle Doves recorded in spring on the coast are migrating not northwards, as one would expect, but south or south-west. The bird arrives in Britain on a general north-west heading after flying over the southern North Sea. Our native birds will doubtless be accompanied by a number of overshooters from the Continental population. Some of our own birds will also overshoot in the appropriate weather (tail wind and fine warm conditions). The result of this will be a reversed coasting movement next day to the south or southwest along the east coast, hence the large numbers recorded there. At Bardney the spring passage is on a small scale, but is invariably of birds flying north, northeast or northwest, irrespective of wind direction. There is certainly no evidence of the southerly movements recorded on the east coast. It is far more likely that the Turtle Doves flying over Bardney are in fact the local (Eastern England) breeding birds arriving.

In autumn, when our native population is far more numerous than in spring, large numbers are rarely seen on the coast of England. This suggests that they emigrate at heights too great to be seen from the ground. If this is so, why then are such large numbers regularly recorded flying southwest over the Bardney ponds especially during August? Once again the simpler explanation is perhaps the most acceptable. This is that these birds are the local population setting out on their return migration. By the time the coast is reached they may have risen to such a height as to be detectable only by radar. If, as radar shows, the main departure in autumn is to the south-east, at what point do these birds change direction — is this possibly gradual as they gain height? Surely a problem which again can only be solved by the close co-operation of ground observers and the radar workers.

This ability to rise quickly until out of sight has in fact been recorded at Bardney on at least two occasions. Both times the birds involved were Black

Terns. In one instance twelve of these birds were feeding quite normally over the large ponds. Suddenly they became very agitated, flying haphazardly in all directions and calling continuously. Half the flock then began ascending until, within minutes, they were lost to sight as they drifted away south eastwards. By this time the remainder had quietened down and were soon feeding normally over the water. This all took place, on both occasions, during the autumn, late in the evening with clear skies and warm still conditions.

Waders

Since 1956 the Bardney ponds have become famous as a haunt of migrating waders, and in the past ten years a total of twenty-nine different species have been recorded. Seventeen of these occur with some regularity, while others such as Oystercatcher, Black-tailed Godwit, Whimbrel, Knot, Turnstone, Jack Snipe and Sanderling may be termed irregular migrants. The Grey Plover, Bar-Tailed Godwit, Temminck's Stint and Red-necked Phalarope have occurred on less than three occasions, and to complete the list there are single records of two American vagrants — Solitary and Bairds' Sandpipers. An impressive list especially as it contains several waders which are normally associated with the coast. On the other hand this is perhaps not so unusual for Bardney, where even such maritime birds as Cormorant, Scoter, Velvet Scoter, Long-tailed Duck and even Kittiwake have been recorded over the years.

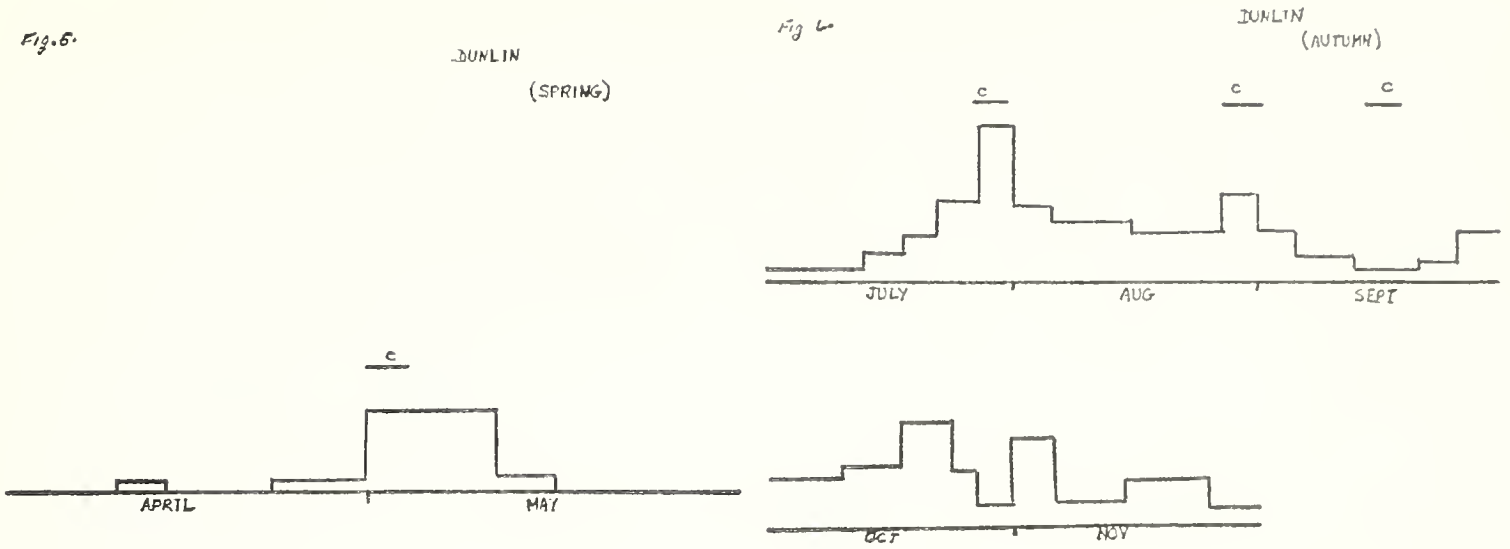
When the *Birds of Lincolnshire* (Smith and Cornwallis, 1955) was published, bird-watching at the Lincoln sewage farm, Grantham sewage farm, the Bardney ponds and several other inland wader haunts had either not begun or was still in its infancy. It is significant that the knowledge subsequently gained at these places has so altered what was then known about certain kinds of waders as to make this excellent publication out of date. I am only going to deal with seven of the twenty-nine kinds of waders recorded at the ponds. These are the species which have occurred every year in the largest numbers. Correlation with the coastal records is not always practicable. I have therefore used, for comparison, a paper by I. C. T. Nisbet (1957) in which he produced frequency curves and tables of certain migrant waders at Cambridge sewage farm over a period of thirty years. Broadly speaking these curves and tables produced very characteristic shapes. In spring, for instance, they showed rapid peaks of a short duration while in autumn the peaks were reached more slowly and were more prolonged.

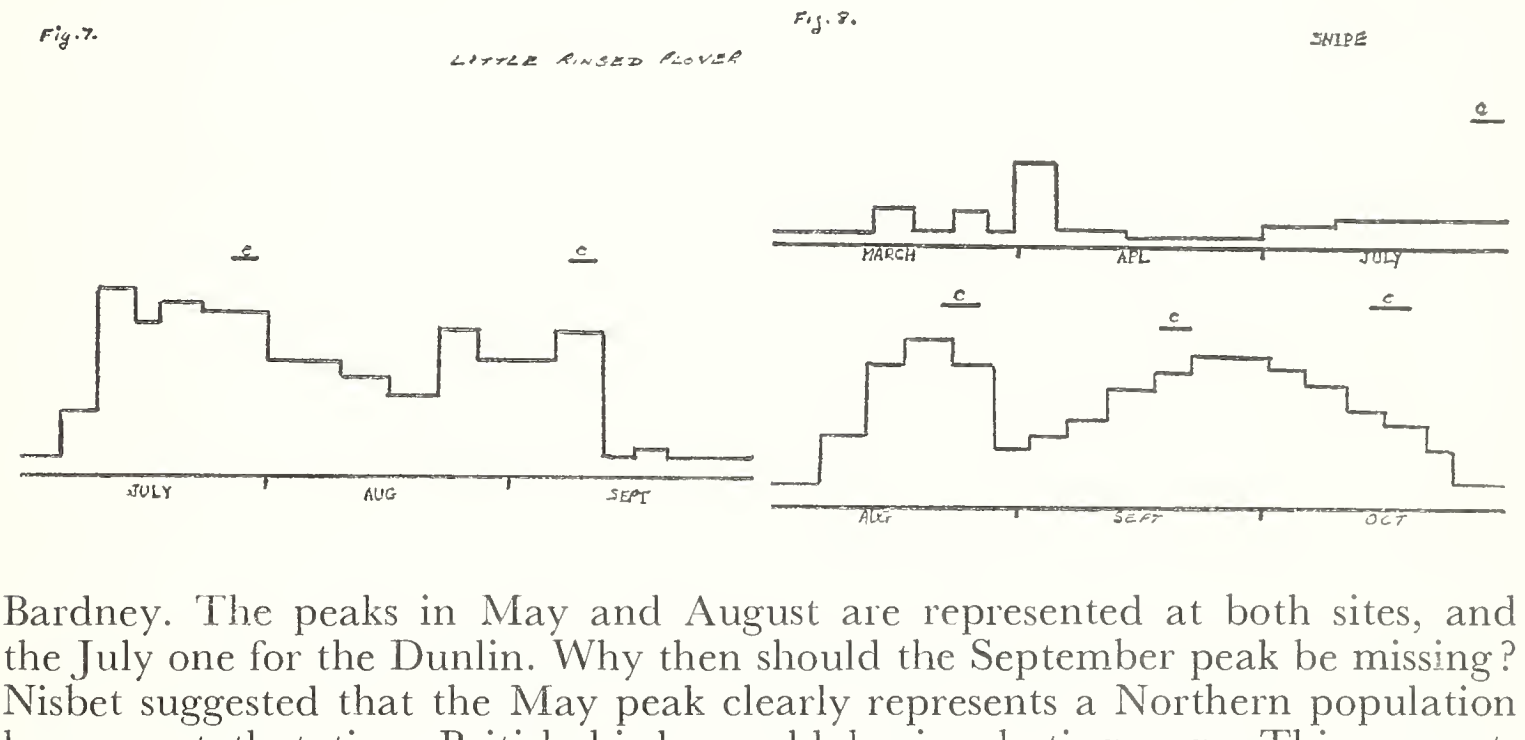
The method I have used is to take five day periods and show on histograms the average number of birds recorded in each. This is necessary to remove the effect of a yearly fluctuation in the acreage of exposed mud, the varying number of visits by observers and the shorter period (*i.e.*, ten years) than that used by Nisbet. In addition I have omitted the occurrence of abnormally large flocks of waders as these tended to distort the general pattern. The letter C on the histograms indicates the peak numbers recorded at Cambridge sewage farm, the length of the stroke denoting the duration of that peak.

It is unfortunate that some of the earlier peaks recorded at Cambridge sewage farm are not revealed at Bardney. This is due to the high water level in the ponds until, usually, late May resulting in little, if any, areas of exposed mud. Comparison of records from the two sites reveals a remarkable similarity with several interesting exceptions.

Ringed Plover and Dunlin (Figs. 4, 5, 6)

I have dealt with these two species together as they are two of the exceptions referred to, inasmuch as the September peak at Cambridge is not reflected at





Bardney. The peaks in May and August are represented at both sites, and the July one for the Dunlin. Why then should the September peak be missing? Nisbet suggested that the May peak clearly represents a Northern population because at that time British birds would be incubating eggs. This suggests that the August birds at Cambridge are of British origin and those Dunlins and Ringed Plovers occurring at Bardney in May are Arctic breeding birds. I would suggest that the absence of a peak in September at Bardney is due to the geographical position of the site. September is the time when vast numbers of Ringed Plovers and Dunlins congregate in the area of the Wash. Some of these birds will be of British origin and non-breeders. It is natural to assume therefore that when these birds move out of the Wash (there is evidence of huge wader movements at that time of the year) the passage will be reflected further south, *e.g.*, at Cambridge sewage farm, and not at the more northerly station at Bardney.

Little Ringed Plover (Fig. 7)

The Little Ringed Plover first bred in Britain in 1938. By 1955 there were about 60 summering pairs in the Country and in 1962 this total had risen to nearly 160. As the number of pairs increased and spread northwards, so the bird increased on passage at such places as the Bardney ponds.

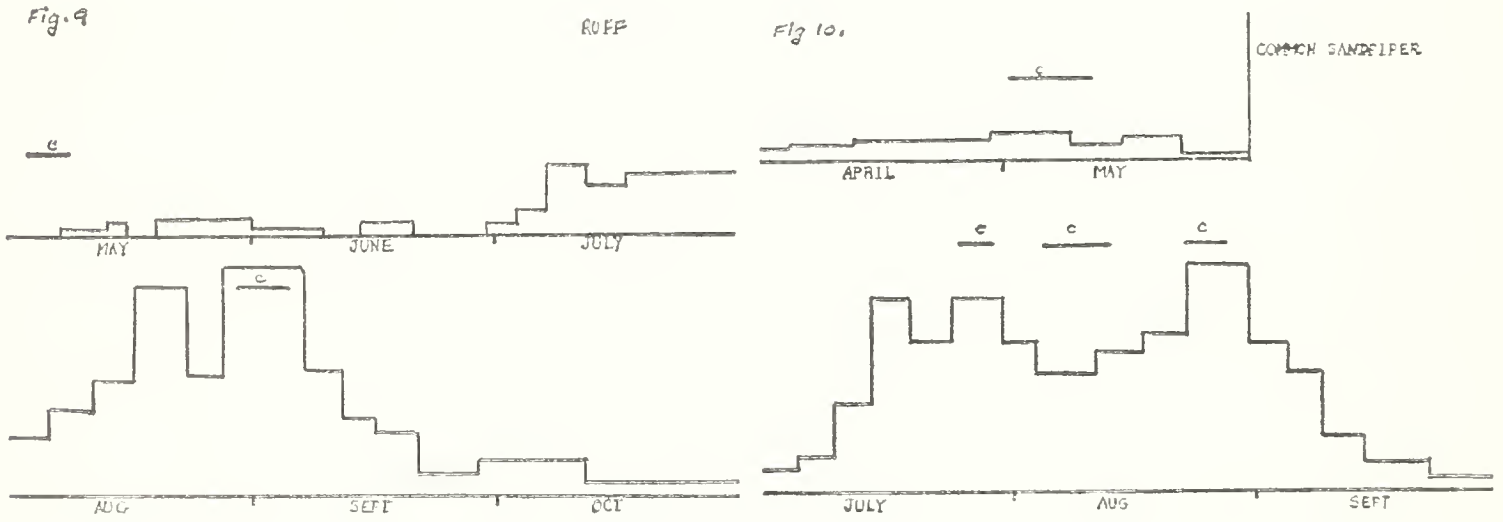
Although the numbers of Little Ringed Plovers recorded at Cambridge are small by comparison with those at Bardney, the peaks, although not pronounced, do conform. A noticeable feature of this passage is its duration, from early July to nearly mid-September. At the breeding sites the Little Ringed Plover is badly effected by interference and disturbance, human and otherwise, flooding being the most frequent hazard. This must have the effect of forcing many of these birds to start the return migration much earlier than if they had bred successfully.

Green Sandpiper

During the earlier years at Bardney the Green Sandpiper was a much commoner migrant than it is today. The reason for this may well be the changing face of the ponds and the fact that more machinery is now used on the site than, say, prior to 1962. The Green Sandpiper is a difficult bird to approach even for an experienced bird-watcher. Such a timid bird will not remain in an area virtually alive, sometimes, with drag-lines, dumpers and bulldozers. The records for the earlier years at Bardney do, however, conform to the general pattern for Lincolnshire as shown by A. D. Townsend (1955) which agreed closely with the Cambridge records.

Snipe (Fig. 8)

In Cambridgeshire the Snipe starts to increase during May and although the numbers fluctuate there is a steady build up to a huge peak in late October with smaller, but definite, peaks in late July, August and mid-September. The Bardney records reveal a very different pattern with a well marked migration from mid-March to the first week of April. The bird is rarely recorded in May and June, but there occurs a pronounced double passage in August and late September. The absence of any large numbers at Bardney in October may be due to the ponds filling up again with water as the beet campaign once more gets under way. The large shallow pond with its low vegetation, where the large numbers of Snipe feed, is usually under water by mid-October.



Ruff (Fig. 9)

The authors of the *Birds of Lincolnshire* suggested that the numbers of Ruffs occurring on passage in the county was probably on the increase. By 1966 this increase was so well marked that the Ruff can now almost be termed one of the commonest inland autumn passage waders. Correlated with this increase is also a northward extention of its wintering range in Britain. It has rarely been recorded at Bardney in winter, but at Grantham sewage farm it is often possible to see fairly sizeable flocks during December. It is much scarcer in spring—in common with all migrant waders inland — but it is possible, occasionally, to see parties of adults, the males resplendent in their breeding plumage. There is no reason why, given adequate protection and encouragement, the species should not join the company of the Avocet and Black-tailed Godwit and once more return to breed in Britain; indeed it is often rumoured that this has already happened.

The Ruff breeds in Europe from mid-May, but not until June further north in Scandinavia. With an incubating period of 21 days it hardly seems likely that those seen at Bardney in June and early July are other than non-breeders.

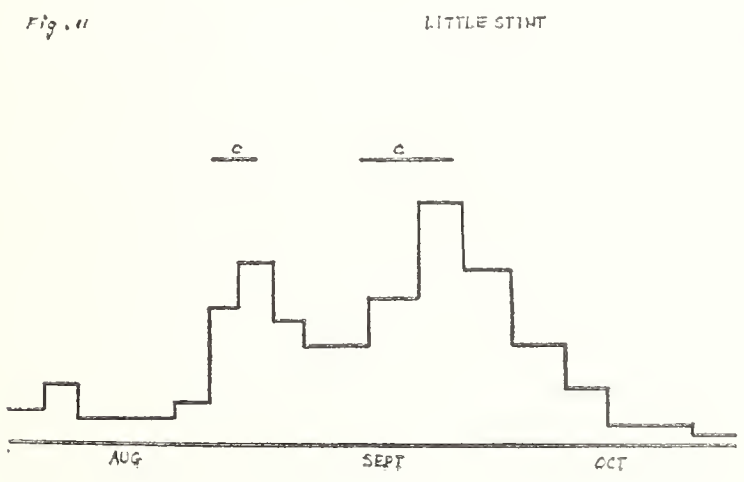
The two distinct peaks in late August and early September, on the other hand, do indicate a strong passage of migrants. Although the peaks are relatively close together they do suggest different populations, one probably from Northern and the other from Middle Europe. At Cambridge sewage farm there is evidence of only one peak, in the first week of September. It is interesting that the curve of the migration of the Ruff at Cambridge encompasses both the peaks recorded at Bardney. It may be that those birds arriving at Cambridge in late August correspond with the first wave at Bardney but, bearing in mind the difference in size between the two sites and the greater amount of disturbance at Bardney, they probably find conditions at Cambridge more attractive for resting and feeding and in consequence remain until the arrival of the second wave.

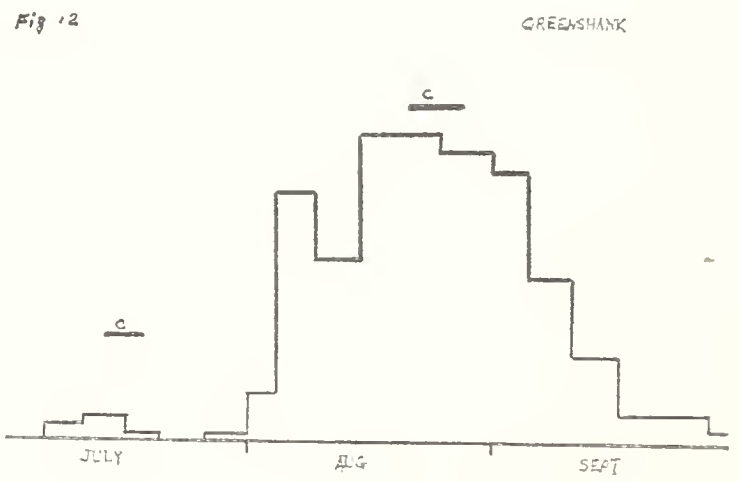
Common Sandpiper (Fig. 10)

The passage of the Common Sandpiper at the Bardney ponds appears to differ considerably from that which takes place at Cambridge. Comparison of records from both stations reveals that at Bardney, during the spring and autumn migrations, the main peaks occur earlier than they do at Cambridge. Nisbet found that figures given by Ingram (1945) showed that in Glamorgan the height of migration of this bird occurred earlier by two weeks in spring and five days in autumn when compared with Cambridgeshire. It was suggested by Nisbet that this could be due to the birds passing through Glamorgan consisting of those which breed in the west of Britain and thereby a different population to the Cambridge birds. He goes on to say, however, that the segregation of different populations on migration at places only 150 miles apart was remarkable, especially as it was found that 'waves' of migrant Common Sandpipers arriving as far west as Co. Mayo did so at the same time as those at Cambridge. Even more remarkable, I feel, is that the timing of the passage at Bardeny should bear more relation to the records from Glamorgan, the inference being that most of the Common Sandpipers passing inland through Lincolnshire are those which have bred in Britain, while those arriving in Cambridgeshire are Continental breeding birds. This is most unlikely, and as far as I can see there is only one solution to this apparent problem concerning the inland passage of the Common Sandpiper. This is for a concentrated ringing programme involving nestlings on the breeding grounds in the British Isles and of passage birds at sewage farms and similar sites throughout the spring and autumn migrations.

Little Stint and Greenshank (Fig. 11, 12)

Although the numbers at Bardney of both these species is small by comparison with those at Cambridge the passage recorded at both sites is identical even to the double peak of the Little Stint.





Ringing

The trapping and ringing of waders at the ponds commenced in 1957. The catching method in the early days was by painstakingly walking them into wire traps set on the exposed mud. The arrival of the mistnet, however, helped to simplify this task and more species came within reach of the ringers. These included wildfowl and many of the smaller passerines. The total number of birds ringed at the ponds over the years is not known, but that the site is an unusually 'lucky' one is borne out by the following selected list of recoveries.

	Ringed Bardney Ponds	*Recovered*
Teal	7.11.65	5.3.66, Herault, FRANCE.
Snipe	17.8.64	21.1.66, Middleton, Cork, EIRE.
	14.8.63	20.10.64, Clipstone, Notts.
Common Sandpiper	19.8.57	25.8.57, Matozinhos (Douro Litoral), PORTUGAL.
Dunlin	29.8.57	24.11.57, Moulay-bou-Selham, MOROCCO.
	27.8.64	15.9.64, Cacia (Beira Litoral), PORTUGAL.
Swallow	21.8.64	30 8.66, South Hykeham, Lincoln.
	17.8.65	27.2.66, Johannesburg, SOUTH AFRICA.
Sand Martin	29.7.64	28.8.66, March, Cambs.
	21.8.64	2.9.64, Wiggenhall, Kings Lynn, Norfolk.
	21.8.64	28.8.64, Pagham, Sussex.
	22.8.64	29.8.64, Pagham, Sussex.
Reed Warbler	27.7.64	14.8.64, St. Ives, Hunts.
Reed Bunting	10.11.63	2.12.66, Tockwith, Wetherby, Yorks.

I have only touched the fringes of the many problems presented by the birds of the Bardney ponds. There is still a great deal of work to be done, both on paper and in the field, and I hope that before another decade has passed we shall know a great deal more about the migrants which pass through this very small part of Lincolnshire.

In conclusion I should like to thank all those bird-watchers who, over the years, have spent many hours at the ponds (often in adverse weather) and without whose records this paper would have been incomplete. I should also like to express my thanks to R. K. Cornwallis and K. Williamson for their help and advice in the preparation of this paper, and to J. Needham, Manager of the B.S.C. factory at Bardney for providing details of the ponds and for allowing access to an area normally forbidden to the public.

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(*concluded opposite*)

TETNEY "BLOW WELLS"

C. Cooper, M.I.C.E., M.I.W.E.

The occurrence of springs is commonplace in a country with a climate, and a complex geological structure like that of Britain. Springs are natural discharges of water from the rock or soil at the surface of the ground or into a body of surface water such as a river or the sea. They break either at the outcrop of the water-table or where a fissure allows the emergence of water under artesian pressure. Gravity springs occur where surface depressions in permeable rocks extend down to the water-table, as in many valleys, or where water flows from permeable strata at the exposed junction with underlying relatively impermeable beds, or at the foot of an escarpment of a permeable formation.

"Excellent examples of artesian springs are numerous in East Lincolnshire, where water under pressure escapes from the Chalk through the overlying Boulder Clay to reach the surface as blow wells." So says the Manual of British Water Engineering Practice in its section on Hydrogeology. What the Manual does not say is that these blow wells are getting far less numerous as more and more ground water is being abstracted and the water-table is being gradually depressed.

The original Grimsby waterworks, established in 1863, depended on the Little Coates blow wells for their supply. These blow wells dried up soon after the turn of the century and the water-table at Little Coates now varies between -5 feet and -25 feet below sea level. Blow wells marked on the Ordnance Survey at Laceby can no longer be located and those near Thornton Abbey have not functioned since boreholes were sunk in an adjacent field in 1957 and water abstracted for the Humberside industries.

There seems little doubt that fresh water springs existed in the bed of the Humber at 'Hessle Whelps' and 'Barton Bulldogs', where it was possible, at low water, for a seaman to put a bucket over the side and draw fresh water for drinking out of the river. With the heavy pumping on both sides of the estuary

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Species recorded at Bardney Ponds, 1956-1966

Red-throated Diver, Great Crested Grebe, Red-necked Grebe, Slavonian Grebe, Black necked Grebe, Little Grebe, Cormorant, Heron, Mallard, Teal, Garganey, Gadwall, Wigeon, Pintail, Shoveler, Red-crested Pochard (escape), Scaup, Tufted Duck, Pochard, Goldeneye, Long-tailed Duck, Velvet Scoter, Common Scoter, Goosander, Smew, Sheld Duck, Pink-footed Goose, Canada Goose, Mute Swan, Whooper Swan, Bewick's Swan, Buzzard, Sparrow Hawk, Marsh Harrier, Hen Harrier, Merlin, Kestrel, Red-legged Partridge, Partridge, Quail, Pheasant, Water Rail, Moorhen, Coot, Oystercatcher, Lapwing, Ringed Plover, Little Ringed Plover, Grey Plover, Golden Plover, Turnstone, Snipe, Jack Snipe, Curlew, Whimbrel, Black-tailed Godwit, Bar-tailed Godwit, Green Sandpiper, Wood Sandpiper, Solitary Sandpiper, Common Sandpiper, Redshank, Spotted Redshank, Greenshank, Knot, Little Stint, Temmink's Stint, Baird's Sandpiper, Dunlin, Curlew Sandpiper, Sanderling, Ruff, Red-necked Phalarope, Great Black-backed Gull, Lesser Black-backed Gull, Herring Gull, Common Gull, Little Gull, Black-headed Gull, Kittiwake, Black Tern, White-winged Black Tern, Common Tern, Arctic Tern, Little Tern, Sandwich Tern, Stock Dove, Wood Pigeon, Turtle Dove, Collared Dove, Cuckoo, Barn Owl, Little Owl, Short-eared Owl, Swift, Kingfisher, Green Woodpecker, Great Spotted Woodpecker, Skylark, Swallow, House Martin, Sand Martin, Carrion Crow, Rook, Jackdaw, Great Tit, Blue Tit, Marsh Tit, Willow Tit, Long-tailed Tit, Bearded Tit, Wren, Dipper, Mistle Thrush, Fieldfare, Song Thrush, Redwing, Blackbird, Wheatear, Stonechat, Whinchat, Black Redstart, Nightingale, Robin, Reed Warbler, Marsh Warbler, Sedge Warbler, Blackcap, Garden Warbler, Whitethroat, Willow Warbler, Goldcrest, Dunnock, Meadow Pipit, Tree Pipit, Rock Pipit, Water Pipit(*), Pied Wagtail, White Wagtail(*), Grey Wagtail, Yellow Wagtail, Blue-headed Wagtail(*), Great Grey Shrike, Red-backed Shrike, Starling, Greenfinch, Goldfinch, Siskin, Linnet, Twite, Redpoll, Mealy Redpoll(*), Bullfinch, Chaffinch, Brambling, Yellowhammer, Corn Bunting, Red-headed Bunting (escape), Reed Bunting, Snow Bunting, House Sparrow, Tree Sparrow.

(*)indicates geographical races.

it is now likely that these springs are acting in reverse and at times of high water in the River, sea water is getting into the chalk and aiding the landward migration of saline water.

At Tetney, however, the blow wells still flourish, as they have not been affected by the overpumped zone from Cleethorpes to Immingham. They are to be found at map reference 007 320 on land belonging to the North East Lincolnshire Water Board.

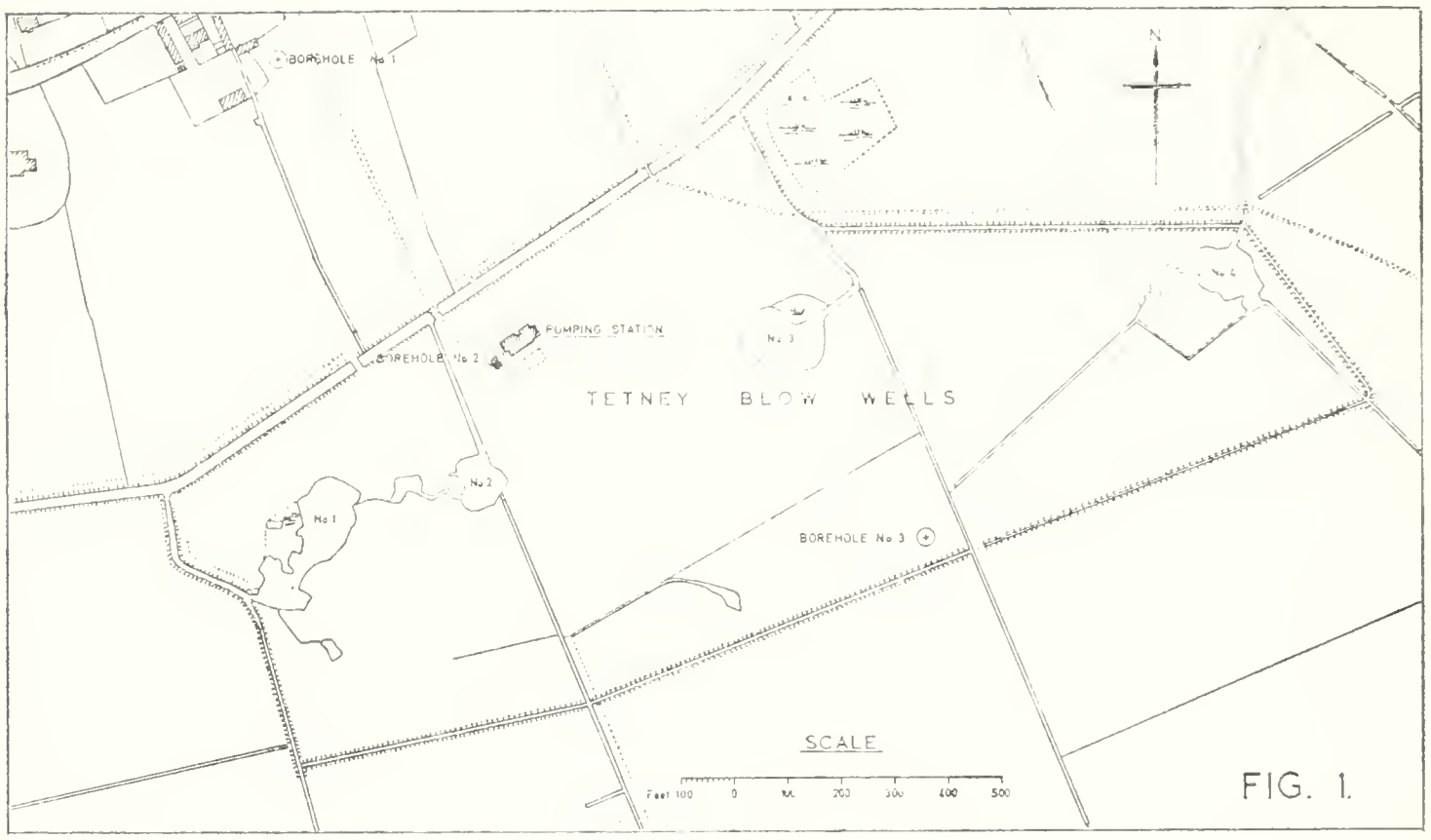


FIG. 1.

Figure 1 shows the blow wells as they appeared on the 1887 Survey. The Survey was revised in 1905, and it must have been at some later date that a low embankment was formed round the entire area of the blow wells, presumably to prevent them from flooding the surrounding land. The Water Board bought part of the site in 1954 and the remainder in 1961 when they extinguished the water cress business which had been conducted on the site.

There was no lack of local legend concerning the blow wells. A farm wagon and pair of horses had disappeared without trace in one of the wells. An attempt to fathom them with 'two plough lines' had failed to find any bottom, and as a superlative of legendry, three of the wells were alleged to be bottomless and the fourth one rather deeper. In 1961, the local sub aqua club were invited to investigate the largest of the blow wells (No. 1 on Fig. 1), and at no point was the water found to exceed 15 to 16 feet, nor was there still any trace of the missing wagon and horses, but the divers did find a recently drowned hare.

When it was decided to use the blow wells as a source of water supply, an attempt was made to de-water the No. 1 well to ascertain the nature of the bottom and the source of water. Two pumps were installed near the well and pumping commenced at about 40,000 gallons per hour. After some 24 hours pumping parts of the bottom were exposed and appeared to consist of very soft silt peppered with innumerable small springs from which water and grains of sand were bubbling.

The lowering of the water level in the blow well removed the support from the surrounding banks, and by the time the level had been depressed by 10 ft. or so, the banks became dangerously unstable and began to slump into the

blow well. There was a risk that a fairly extensive area around the well would become unstable and a risk of the pumps sliding into the well, so at this stage the exercise was abandoned. One or two sizeable pike were marooned in shallow water during the process.

Although the bottom of the blow wells appeared to be treacherously soft, when the time came to drive 12 ins. x 12 ins. timber piles into the bottom to carry draw off pipes, in No. 1 blow well only 2 or 3 feet of penetration could be obtained. This was not enough to achieve stability and a group of four piles had to be driven in the form of a trestle. In the adjoining No. 2 well, the 20 ft. piles had to have another 10 feet spliced on and nearly 20 ft. of penetration was achieved before an acceptable rigidity was obtained.

The general level of the ground at Tetney blow wells is 8 to 10 feet above Ordnance Datum, whereas the ground water level ten miles away in the Wolds is frequently as high as 300 ft. above O.D. and as the top of the chalk at Tetney is some 65 ft. below ground level, the static head on the ground water at this point is around 360 ft., equivalent to 156 lbs. per square inch or 10 tons per square foot. Static conditions do not, of course, exist, and if the water was not escaping through the blow wells it would be thrown out at the foot of the outcrop.

The drift overlying the chalk at Tetney consists of boulder clay and silts with occasional sand lenses and these structural weaknesses in the drifts have been penetrated by ground water under high pressure, and many centuries of erosion have resulted in the formation of the blow wells. See Fig. 2.

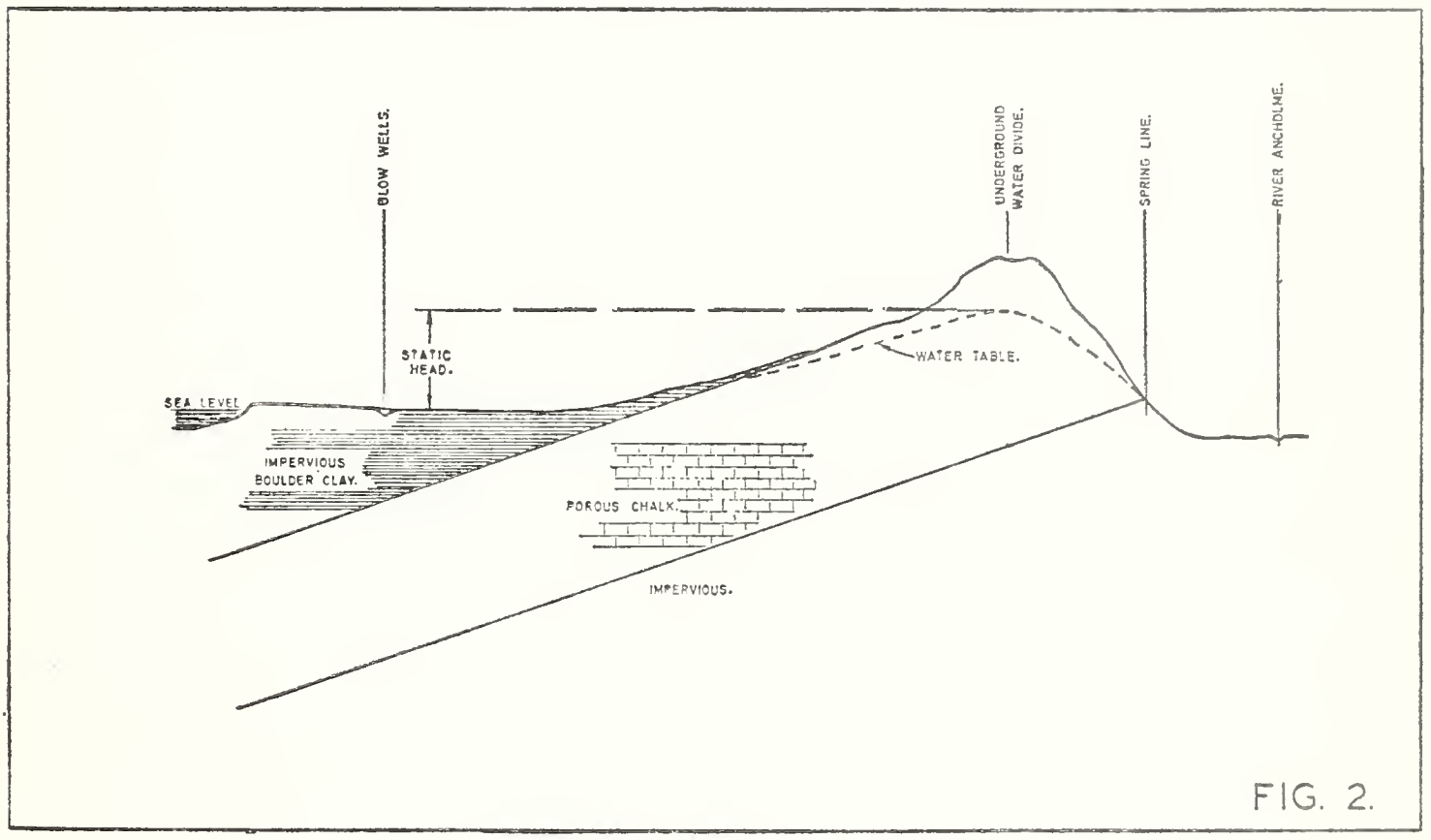


FIG. 2.

Observation of the blow wells at Thornton Abbey at the time they were first de-watered revealed marked differences in the form of the springs. These blow wells, four or five in number, were all comparatively small, ten or twelve feet in diameter and only from four to six feet in depth, in the bottom of which was a single clear aperture, roughly circular in shape, about the size of a fox hole, and spiralling down almost vertically into the clay.

As this observation was made in 1957, similar conditions were expected at Tetney, and when the divers of the sub aqua club failed to locate any clearly defined waterways, the de-watering with pumps was undertaken to try and locate the main springs onto which large diameter tubes could have been

lowered and water obtained free from any trace of surface pollution. In the result this was not practicable and water is taken from the blow wells by the simple expedient of carrying a 9 ins. diameter (in largest well 12 ins.) steel tube out from the bank to a point some fifteen feet from the bank with the free end supported on timber piles. The tubes are fixed about 3 ft. below the water surface and a downward pointing bend is fixed to the open end.

The open ends were left without grills as it was considered that a coarse mesh would serve no useful purpose and a fine mesh would have been choked by algal growth, necessitating a permanent catwalk for access and a tricky cleaning operation as the screen would have been submerged by about 5 ft. of water.

Water flows by gravity from the blow wells through the pipes to a sump, from which 10 ins. diameter centrifugal pumps raise the water to a micro-strainer. The strainer is a rotating drum covered with stainless steel wire woven into a fabric with apertures of 23 microns (23 millionths of a meter) which excludes suspended matter, mostly algae and skeletons of diatoms.

Anything reaching the strainer must have passed through the pumps. Young pike of 4 or 5 inches and eels up to 9 ins. can be 'pumped' through these relatively small pumps seemingly without harm, a 10 ins. pike did not survive the operation, nor did an 18 ins. eel although it was still in one piece.

The water from the blow wells has the same qualities as chalk spring water, but without the same freedom from bacteriological contamination. The blow wells support some fish life, mostly, if not entirely confined to pike and eels, and a large colony of moorhens. A pair of swans breed each year close to No. 1 blow well. Even so, it is considered adequate to provide only straining and sterilisation before supplying the water for domestic use.

The rate at which the blow wells flow varies from year to year and throughout the season. Flows of $4\frac{1}{2}$ million gallons per day have been recorded. Generally the yield begins to rise about December or January, reaches a peak some time about April and then gradually declines again until the end of the year. The flow in the autumn of 1965, which was the end of a three year drought, was down to rather less than 2 m.g.d. and this figure can reasonably be taken as the minimum flow of the wells, although a flow of only slightly in excess of 1 m.g.d. was recorded, again in the autumn of the year when heavy test pumping was taking place from boreholes sited $1\frac{3}{4}$ miles to the south.

It is of note that heavy rainfall in the Wolds causes a rise in the flow of the blow wells approximately three months later, and the effect of exceptional rainfall is felt within two months. This is not to say that rain falling on the exposed chalk of the Wolds reaches Tetney blow wells in two or three months. It is more likely that the rainfall causes a fairly quick rise in the level of the water-table in the Wolds and this 'hydraulic pressure wave' travels through the aquifer at a rate sufficient to affect the blow wells in two or three months after the rise takes place.

The actual rate of passage of water through the chalk is much slower, and it is believed that a rain drop percolating into the ground on the high Wolds probably spends two or three years in its passage through the chalk before again seeing the light of day at Tetney.

The Tetney blow wells are a source of great fascination to the countryman. They must have functioned for very many thousands of years, but how much longer they will continue to function is a matter for conjecture. Ideally the authorities should maintain a true water balance, and if this could be achieved, we should always have these blow wells. In practice it is doubtful if the pressure to abstract more and more water from the ground can be resisted. If it is not resisted it will be the end of the blow wells, they will dry up like all the others have now done and it will be a sad loss to the natural history of north east Lincolnshire.

THE DISTRIBUTION OF HYDRACARINA [WATER MITES] IN THE HOBHOLE DRAIN AND THE SOUTH FORTY FOOT DRAIN

D. B. Sattelle, B.A.

Introduction

A preliminary investigation of the distribution of Hydracarina in the watercourses of the Boston area revealed many different species. As a result a more detailed survey of the Hobhole Drain and South Forty Foot Drain, both lenitic watereourses, was planned.

The aims of the survey were:

(*a*) to compare the species present; to study the distribution of Hydracarina throughout the Hobhole Drain, and the South Forty Foot Drain between Donington and the outfall to the Haven, and

(*a*) to compare the species; to study the distribution of Hydracarina throughout the Hobhole Drain and the South Forty Foot Drain between Donington and the outfall to the Haven, and

(*b*) to consider the factors responsible for the distribution recorded.

All the work for this survey was completed in June, July and August, 1964.

Hydracarina

(*a*) Classifieation and Morphology

Water mites constitute the suborder Hydraearina within the order Trombidiformes, one of the three orders into which the class Aeari, whieh ineludes all mites and ticks, is divided. They are typically brightly coloured, oval in outline dorsally, but more or less flattened dorsoventrally. The body has no external subdivisions and the body wall is either soft or chitinous; chitin may be deposited in plates or form a complete exoskeleton.

There are two pairs of lateral eyes containing either black or red pigment, and connected in *Eylais* speeies by an ocular bridge (diagram 2). A colourless eentral fifth eye may be present and a pair of fine segmented palpi invariably project forwards from the ventral surface sometimes bearing distinctive papillae or hairs. A cone shaped capitulum formed by fusion of the maxillae, gives rise to the palpi and encloses the mouthparts. This terminates in a rostrum which may be a long tube or a short projection (diagram 1).

Adults have four pairs of legs, each leg composed of six segments, the distal segment bearing two, rarely three rectractible claws. The legs which bear bristles or swimming hairs are attached to the body by large ventral plates — the epimera. The anus is towards the posterior region of the body behind the genital cleft which occurs either between or behind the epimera, and may be flanked by lips. On either side of the cleft are genital plates bearing characteristie markings — acetabula, the funetion of which is obscure. Sexual dimorphism is not always evident.

(*b*) Life History

The life history has four stages — egg, larva, nymph and adult. The eggs, usually red and protected by mucilage, are deposited on submerged objeets such as plants, large stones, etc. The emergent larvae are elongated and bear a large capitulum. Resting stages of the larva are typically parasitic upon aquatic insects and small fish, and precede the free living nymphal stage. The nymph resembles the adult but has no genital cleft and only three pairs of legs. Several pupal stages precede the adult which, like the nymph, is a free living earnivore feeding upon Cladocera, Copepoda, Oligoehaeta, Diptera (larvae) and other Hydracarina.

Diagram 1. (a)

HYDRACHNA GLOBOSA

DORSAL SURFACE

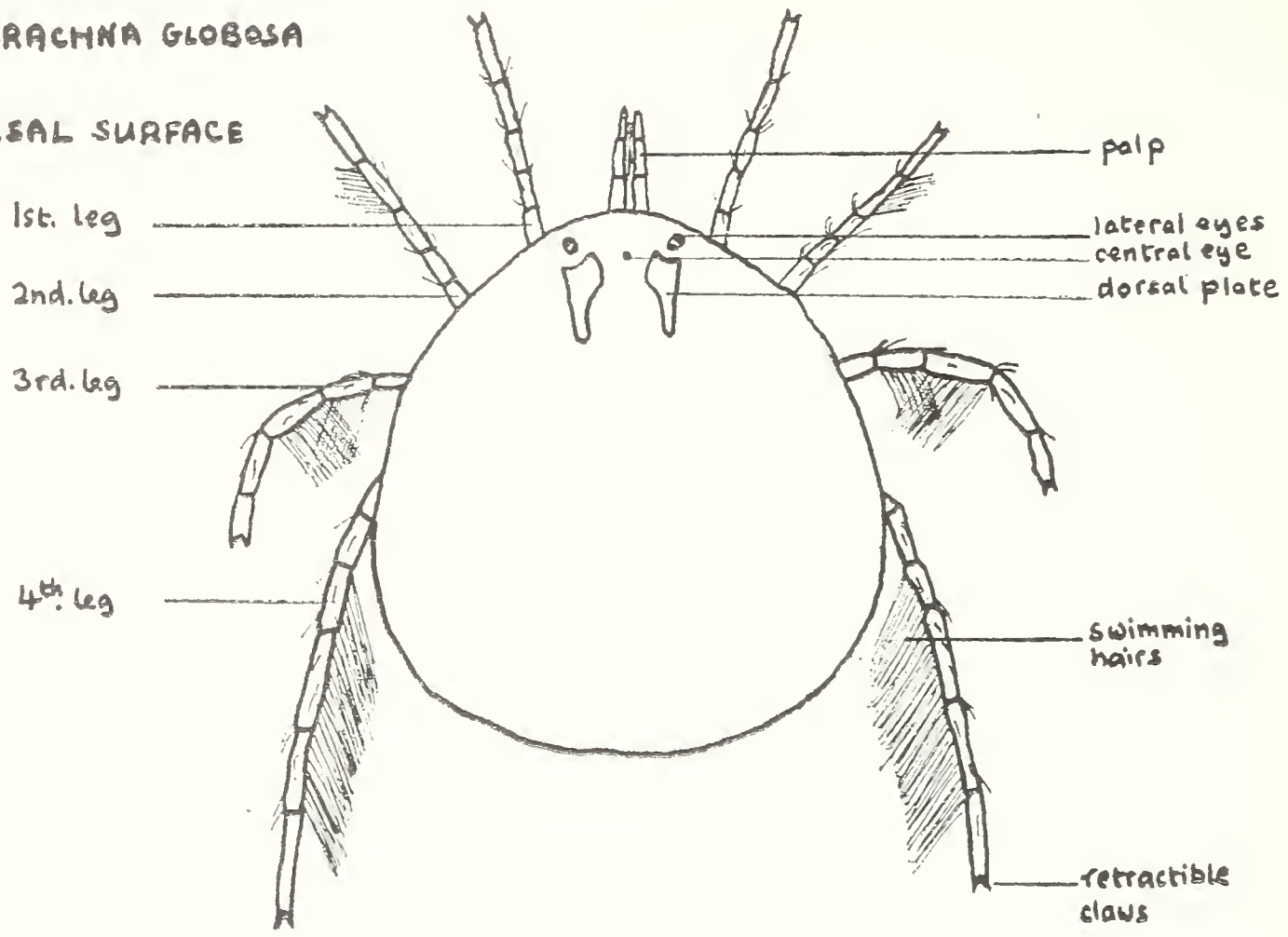
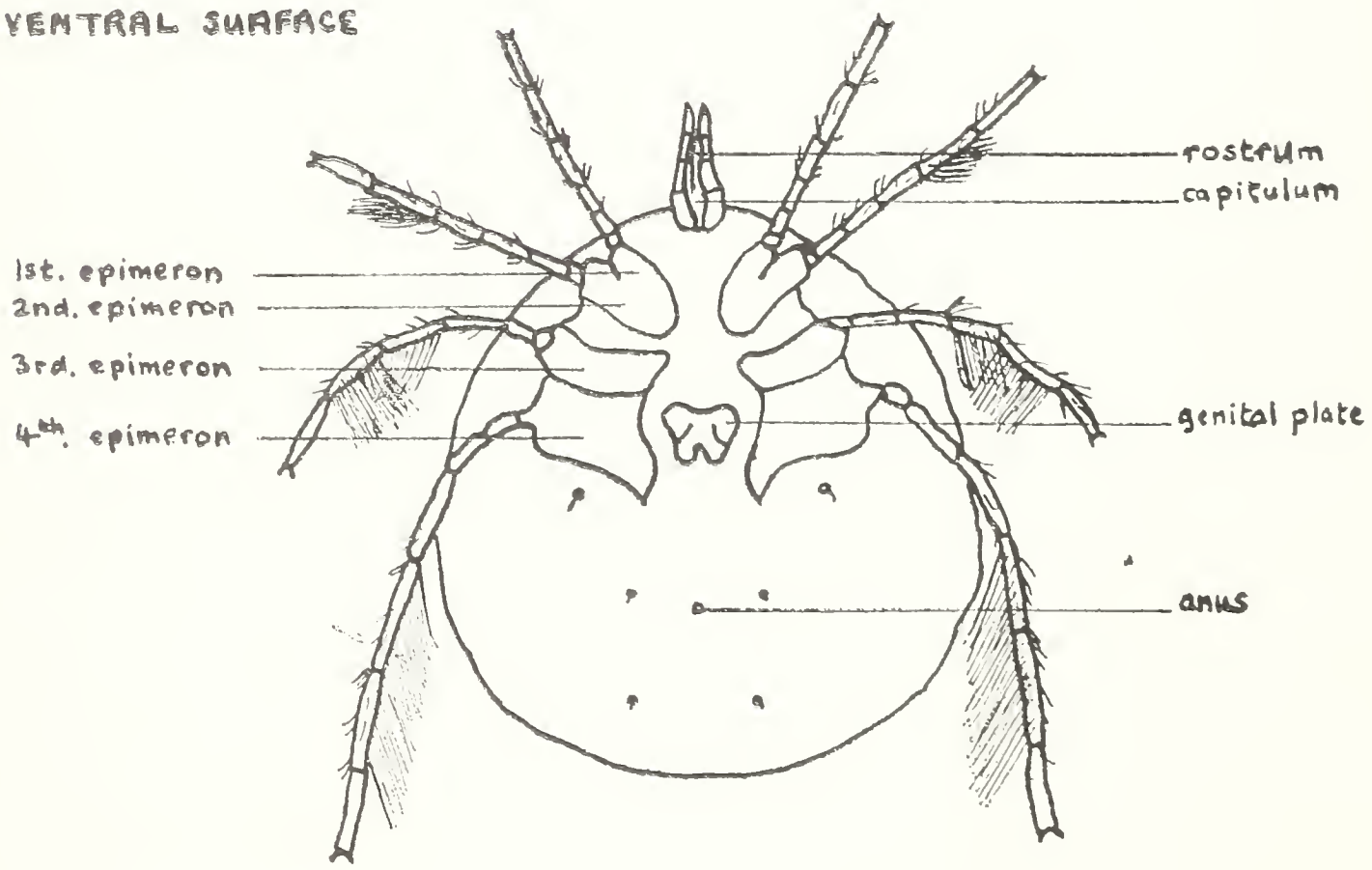
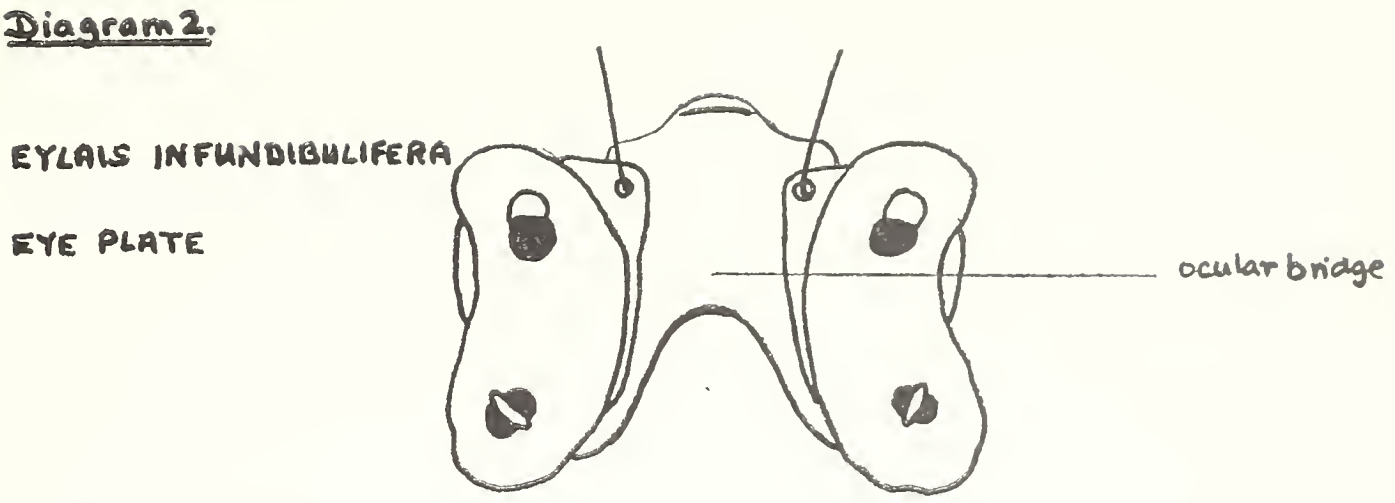


Diagram 1. (b).

HYDRACHNA GLOBOSA

VENTRAL SURFACE





Methods of study

(*a*) Sampling, preservation, and identification of Hydracarina

A sample for a particular station consisted of a sweep with a pond net along a 50 yard stretch of water within a distance of four feet from the water's edge. The sweep which was timed to last twenty minutes was performed using a pond net (20 meshes per inch) with a rectangular frame of dimensions 15 ins. x 12 ins. The biological samples thus obtained were analysed on the same day as collection.

All hydracarina were removed from the biological samples for preservation. The fluid used for this preservation was Viets' solution, a mixture of 10 vols. glycerine, 3 vols. acetic acid and 6 vols, distilled water. Identification (1, 2) was usually possible without dissection although with *Eylais* species it was preferable to remove the ocular bridge.

(*b*) Chemical analysis of water and analysis of weed growth

At each station the pH value and chloride content of the water was determined. Also an estimate of the abundance of the various species of weed was made for the area sampled.

Details of watercourses investigated

(*a*) The Hobhole Drain

The Hobhole drains much of the low lying land to the north-east of Boston, and extends for 13 miles between Toynton Fenside and Fishtoft, where it enters the Haven. Two pumping stations, one at the outfall to the Haven and the other at Lade Bank regulate the flow of water along the drain. Throughout the survey the flow was negligible.

There is a steep descent from the bank to the middle of the drain, and towards Toynton the drain becomes progressively more shallow. The bed of the drain is of a silty nature and the water between the outfall and Midville throughout the survey supported large algal blooms — particularly *Prymnesium* sp. Between Midville and Toynton, although the bottom of the drain is silt, the water has become very clear. Most of the protection for invertebrate life was provided by aquatic grasses and *Enteromorpha* sp. during the period of the survey.

(*b*) The South Forty Foot Drain

This drain extends some 20 miles from Guthram Gowt, near Pinchbeck Bars to Boston, where it enters the Haven and drains the low-lying land to the South-west of Boston. At the time of sampling repairs to banks and widening of the drain were in progress above Donington and thus the section of the drain considered was the 9 miles between the outfall and

Donington. A pumping station at the outfall regulates the flow of water along the drain, which was negligible during the survey.

The depth of water at the edge of the drain was approximately half that at the centre indicating a relatively horizontal bed, consisting of silt between the outfall and Swineshead, but above this it becomes somewhat stony. The cover for invertebrates is provided largely by overhanging grasses at the edge and at greater depths by submerged weeds.

Results

(*a*) The occurrence of Hydracarina in the watercourses.

Summary of all samples taken.

Species	*Hobhole Drain*	*South Forty Foot Drain*	*Species*	*Hobhole Drain*	*South Forty Foot Drain*
Arrenurus claviger	*		*Hygrobates longipalpis*	***	
Eylais infundibulifera		*	*Limnesia connata*	*	
Eylais rimosa	*		*Limnesia fulgida*	***	**
Eylais soari		*	*Limnesia koenikei*	**	
Feltria minuta	*		*Limnesia maculata*	*****	**
Hydrachna cruenta	****	*	*Piona carnea*	*	*
Hydrachna globosa	****		*Piona coccinea*	*	
Hydrachna paludosa	**		*Piona longipalpis*	**	
Hydrodroma despiciens	**	**	*Piona rotundoides*	*	
Hygrobates fluviatilis	***		Total species ..	17	7

KEY:
***** — occurring in all samples.
**** — occurring in over 75% of samples.
*** — occurring in 50% — 75% of samples.
** — occurring in 25% — 50% of samples.
* — occurring in less than 25% of samples.
— absent.

(*b*) The distribution of Hydracarina throughout the watercourses. See Figs. 1 and 2.

Discussion

(*a*) Sampling Technique

The sampling technique used was similar to that favoured by H. B. N. Hynes (3) in which the time of the sweep was fixed, but in this survey both time and the area of water sampled have been standardised. The large sample area considered enabled incorporation of all types of vegetation at a particular station. These precautions, considered together with the uniform nature of the watercourses, enabled a quantitative comparison of the Hydracarina from different stations to be made.

(*b*) Distribution of Hydracarina

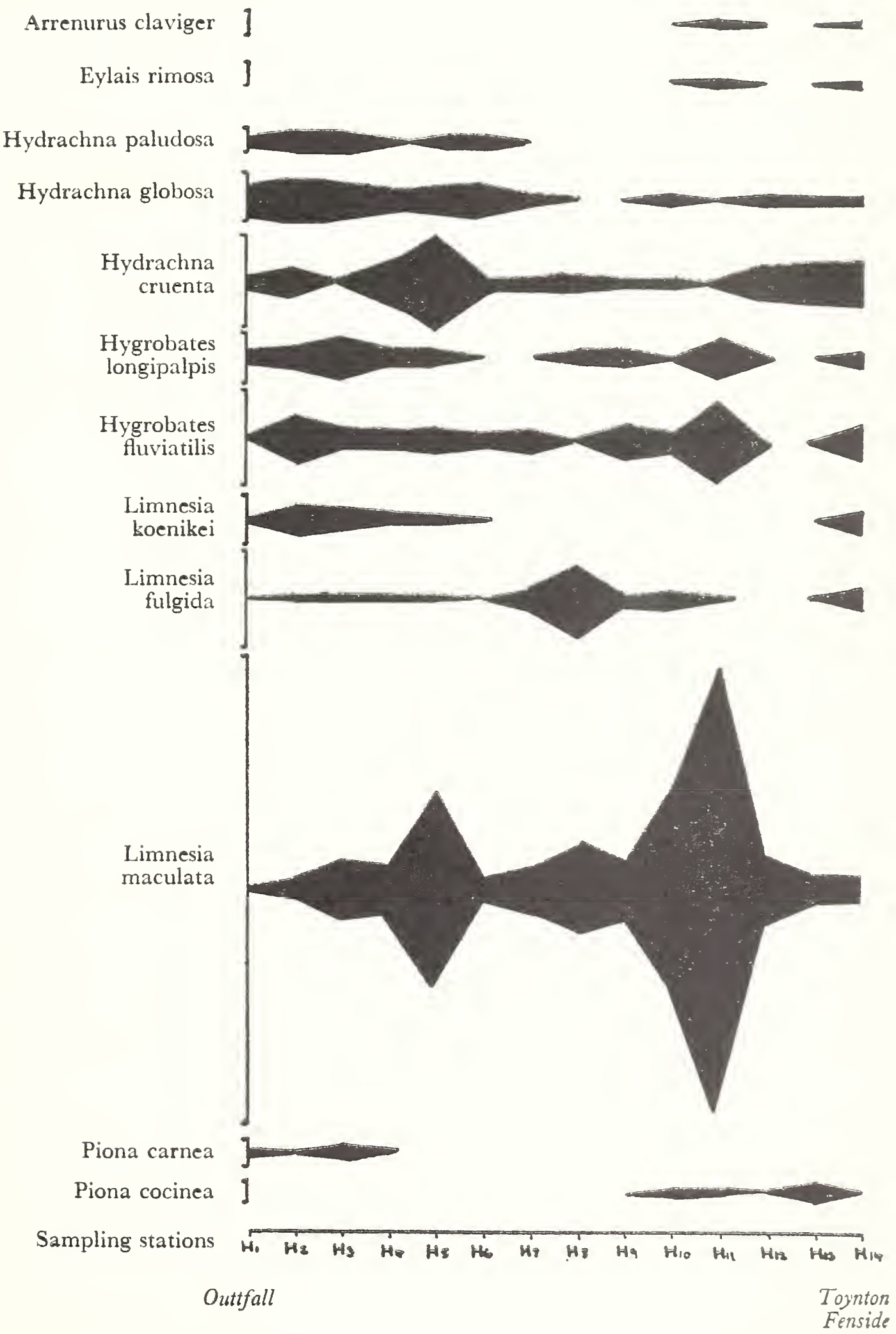
(1) To compare species of Hydracarina in the Hobhole Drain and South Forty Foot Drain

Of the nineteen species recorded from the two watercourses, only five, *Hydrachna cruenta*, *Hydrodroma despiciens*, *Limnesia fulgida*, *Limnesia maculata* and *Piona carnea*, occurred in both. Only two species, *Eylais soari* and *Eylais infundibulifera*, were peculiar to the South Forty Foot Drain, whereas twelve species were found in the Hobhole, but not in the South Forty Foot Drain.

Of the species common to both watercourses, only *Hydrodroma despiciens* was present to the same extent in both, the others were far more abundant in the Hobhole than the South Forty Foot Drain. This together with the

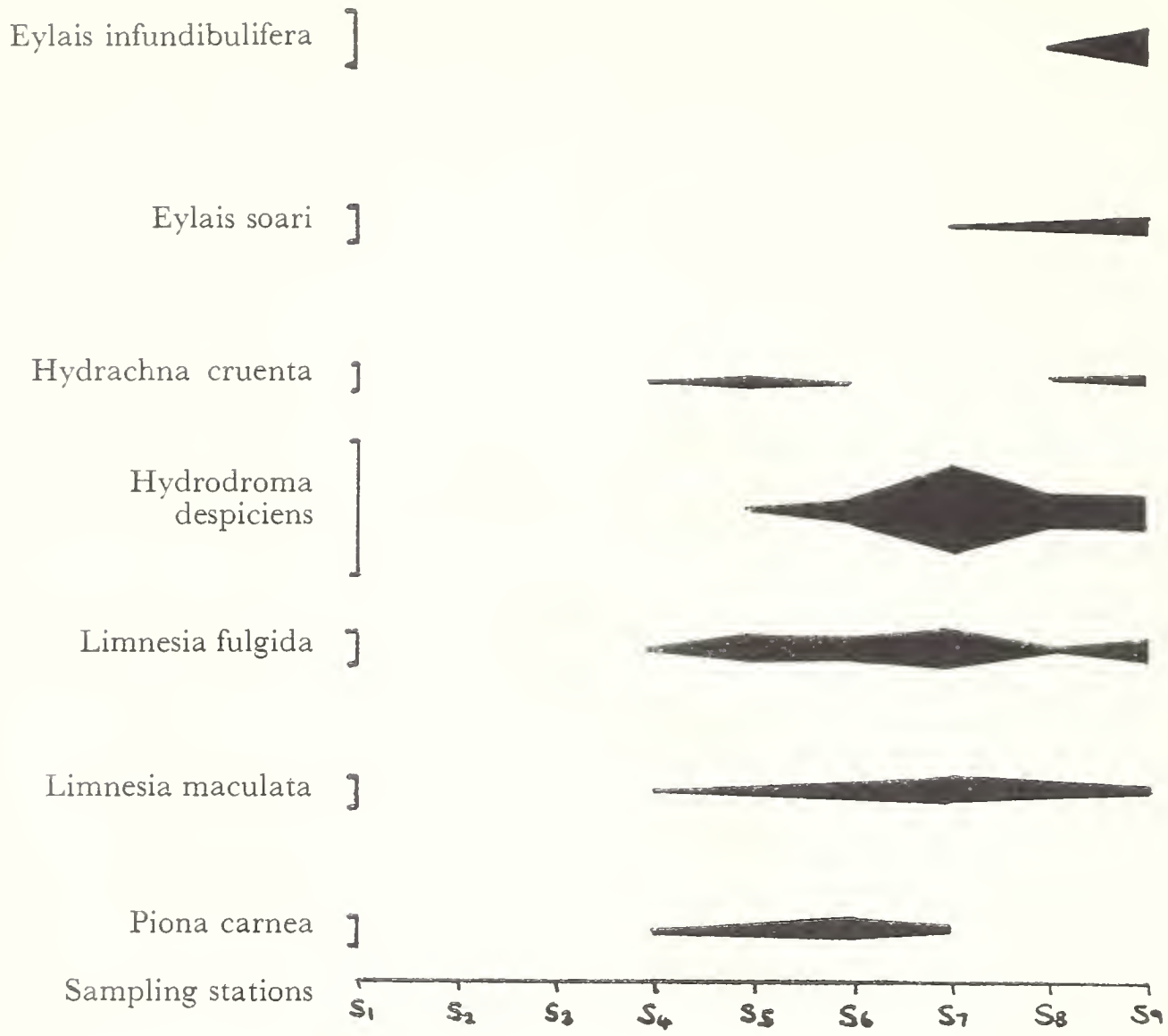
fact that in all seventeen species were found in the Hobhole and only seven in the South Forty Foot indicated that conditions in the Hobhole were better suited to support Hydracarina.

Fig. 1 *Distribution along the Hobhole Drain*



(*shading proportional to number of individuals*).

Fig. 2 *Distribution along the South Forty Foot Drain*



Outfall *Donington*

(*shading proportional to number of individuals*)

(2) To study the distribution of the species of Hydracarina along the watercourses

Hobhole Drain. The number of species and the total number of Hydracarina was by no means constant along the drain. Both *Hydrachna paludosa* and *Piona carnea* appear to be limited to the lower reaches of the Hobhole, whereas *Arrenurus claviger*, *Eylais rimosa* and *Piona coccinea* were only recorded from the upper Hobhole. *Limnesia maculata* was by far the most abundant species and the only one to be recorded from every station. A feature of the distribution of practically all species present in the lower Hobhole was that numbers were greater just above Nunn's Bridge than at the outfall pumping station.

South Forty Foot. The most notable feature of these results was the fact that no specimens were recorded in the lowest 2 miles of the drain. Above this specimens were obtained and numbers increased. A total of nineteen hydracarina was the highest recorded and there were never more than five species at a particular station.

(3) Factors that may have influenced distribution of Hydracarina

pH. This varied little throughout the watercourses and there was no significant difference between values recorded from the two watercourses.

Weed growth. From the comparison of the watercourses it was clear that the cover for invertebrate fauna was provided by essentially the same species of weed, although present in different proportions.

Physical factors. The rate of flow of water in both watercourses was negligible throughout the survey. The silty nature of the beds of both drains was largely unchanged throughout their lengths.

Chloride content. The chloride contents of the two watercourses throughout this survey were comparable and showed a similar variation—gradually decreasing towards the higher reaches of both. Until 1962, very high chloride contents were recorded (4) on the South Forty Foot Drain as far as Donington. During this period Hydracarina were collected at Donington, but between the outfall and Donington there appeared to be a 'chloride barrier' to further penetration downstream. Since the chloride content has been reduced, by replacement of the old sluice gates at the outfall, recolonisation has taken place between Donington and Hubbert's Bridge, but not beyond. Also the chloride contents from the outfall regions of the two watercourses were abnormally high due to leakage of sea water. This has provided an explanation for the fact that all species represented at the Hobhole outfall pumping station showed an increase in numbers just above Nunn's Bridge.

Thus the chloride content appears to have limited the distribution of Hydracarina to a degree. Its effect may have been indirect by limiting the distribution of the organisms on which they prey or a direct effect on the Hydracarina. Further work is needed to resolve this.

Other Factors. Biotic factors will also have influenced the distribution of Hydracarina to a greater or lesser extent and may have been responsible for the various peaks of distribution or restriction of certain species to the upper or lower Hobhole.

This survey could not have been completed without the permission of the Lincolnshire River Authority for use of their laboratory, some equipment and the results of unpublished surveys.

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GEOLOGY

A. Straw, b.a., ph.d.

Much interest continues to be shown in Lincolnshire geology, many aspects of which are of interest to naturalists. Much work has been done in the county since the Union's publication "The Geology of Lincolnshire" was written, and well over sixty papers have appeared in learned journals. Lincolnshire is situated on the eastern fringes of the East Midlands and South Yorkshire coal and oil fields, and near the western margin of the newly discovered natural gas fields of the North Sea. In addition, there seems to be a persistent need to prove and exploit iron ore reserves in the north of the county, and there exists an urgent need to resolve the problems of water supply for the thirsty industries and peoples of Grimsby and Immingham. All these stimulate interest in the geology of the county.

With reference to relatively recent geological events, geomorphological investigations have much to offer. Lincolnshire is rich in glacial and periglacial deposits, and much of its surface in the Wolds and along the Cliff and Heath was fashioned in Pleistocene times. Studies of surface form, landforms, and superficial materials and weathered rock waste can contribute greatly to the understanding of soil development and distribution, ground water movement, and micro-climatic conditions, and are therefore relevant to the work of the plant and animal ecologist. Lincolnshire landforms and deposits record many of the events connected with repeated glaciation and deglaciation, oscillations of sea-level, river diversions and migrations of plants and animals. In the Ancholme and Witham valleys, and along the east coast as well as in the Fens, Late- and Post-glacial deposits undoubtedly retain a wealth of evidence relating to the last 10,000 years or so. Naturalists desire an understanding of landscape in the broadest sense of the term; the geology and geomorphology of the county provide the framework on which many other natural phenomena depend.

I should like to institute and maintain a register of exposures of rocks and drifts in the county, including natural sections, quarries, and temporary exposures created for instance during road works and building and pipeline excavations. The latter are particularly important with respect to glacial drifts and periglacial phenomena, and I should be grateful if information such as map reference, parish, owner of quarry, and any details of the nature of rocks, drifts and tectonic features visible could be brought to my notice.

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FOSSILIFEROUS DOGGER IN NORTH LINCOLNSHIRE

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In 1964 a regional gas pipeline was laid from Killingholme, near Immingham, to Leicester, the trench providing a wealth of new information on the surface rocks in areas where they had been rarely exposed. A section close to Blowthorne Sitwate farm, between Wressell and Castlethorpe, one mile N.W. of Brigg (Grid. 983084) exposed an unusual development of the Middle Jurassic rocks. The section was cut by faults, but in presumed stratigraphic order the members exposed were as opposite:

The critical section of the trench was cut into low ground at the foot of the Lincolnshire Limestone dip slope (Bed c, above) and it is apparent that the Dogger and Lower Estuarine form a small up-faulted block bounded by faults of 50 feet or more vertical displacement. In 1966 a parallel trench again cut the Dogger, this time in the core of a faulted pinched anticline (Grid 983085) flanked by Lincolnshire Limestone and Great Oolite. Interpretation of the structure will depend on further mapping; at the present time it is not clear whether it could be a periglacial phenomenon, or is deep seated.

Absence of the Lincolnshire Limestone down dip from outcrop near Wressell had earlier been indicated by water borings; the new case is of interest, and in fact is of economic importance in relation to water supply problems.

The main new stratigraphic factors are, firstly, the development of Dogger Ironstone which is usually represented only by a nodule band in North Lincolnshire (the main development thins out northwards near Ingham), and, secondly, the presence in it of a fauna with strong Yorkshire affinities. Dogger reappears at outcrop northwards beyond Malton in mid-Yorkshire, and the new evidence suggests that the bed was originally largely continuous, having been removed by intra-Jurassic erosion from the intervening region of the Market Weighton block with its flanking areas.

			Exposed Feet	*Thickness Inches*
Drift and Boulder Clay	g.	Alluvium of Ancholme flats	at least	3	0
	f.	Purplish brown stiff clay	say	10	0
Great Oolite Series	e.	Blue shaly siltstone and silty clay, weathering light brown, with *Ostreae* of the *hebridica/subrugulosa* group in large quantities; *Modiolus* sp., *Trigonia* sp. and other lamellibranchs	say	8	0
	d.	Greenish, yellow and purple unfossiliferous clay	say	5	0
Lincolnshire Limestone	c.	Soft oolite (much disturbed), with common large thick-shelled lamellibranchs and large *Nerinea*?	seen to	2	0
Lower Estuarine Series?	b.	Soft very fine-grained white sand and a little yellow bedded soft sandstone	at least	5	0
Dogger	a.	Deep brown weathered iron-stone with occasional phosphatic nodules, containing abundant brachiopods, incl. *Rhynchonelloidea* cf. *cynica* (S.S. Buck), *Tetrarhynchia tetrahedra/subconcinna* (Dav.), ?*Grandirhynchia* sp., and *Lobothyris trilineata* (Y and B). Also *Velata grade* (Bean) and ?*Entolium* sp.	at least	4	0

The Dogger fossils were identified by Dr. H. Ivimey-Cook of the Institute of Geological Sciences.

BOTANY

Miss E. J. Gibbons

Tetney Blow Wells: natural artesian wells with a rich aquatic flora — particularly fine Water Starwort (*Callitriche* spp) and Water Violet (*Hottonia*), and quantities of Canadian Waterweed (*Elodea*). Sedges were many and various but the Greater and Lesser Pond Sedges (*Carex riparia* and *acutiformis*) were most plentiful. Marsh Marigolds (*Caltha*) and Cowslips (*Primula veris*) were in full flower.

Burwell Wood: once owned by the father of Dr. Martin Lister who visited it in 1666. Now Forestry Commission, when visited in May the following were found: Lady's Mantle (*Alchemilla* spp.), Ramsons (*Allium ursinum*), Wood Anemone (*A. nemorosa*), Wood Sorrel (*Oxalis*) Eared Willow (*Salix aurita*), Great Woodrush (*Luzula sylvatica* and *pilosa*), Giant Horsetail (*Equisetum telmateia*), Lady Fern (*Athyrium*) and Soft Shield Fern (*Polystichum setiferum*).

Risby Warren: a relic of the vast rabbit warrens of north-west Lincolnshire, pelts being sold in Brigg where there was a fur top hat industry. The soil is sand over limestone giving steppe conditions — very dry in contrast to the former Crosby Warren which was a wet acid heath. Where the limestone is bare of sand there is a noticeable change of plants. About fifty years ago Marram grass was introduced to stabilise the continually blowing sand. On the limestone noticeable plants were Purple Milk Vetch (*Astragalus danicus*), Centaury (*C. erythraea*), Viper's Bugloss (*Echium vulgare*), Carline Thistle (*Carlina*), Stemless Thistle (*Cirsium acaulon*), Tor grass (*Brachypodium pinnatum*). On the sand a good deal of Heather (*Calluna*), Buck's-horn Plantain (*Plantago coronopus*), Houndstongue (*Cynoglossum officinale*) and Smooth Catsear (*Hypochoeris glabra*) were found.

Castor Hanglands: a nature reserve in Northamptonshire. An old limestone quarry at the entrance had Man Orchid (*Aceras*) and Yellow Wort (*Blackstonia*) but further on it was more acid. A marshy spot with Lousewort (*Pedicularis sylvatica*), Pink Marsh Orchids (*Dactylorchis strictifolia*), Distant Sedge (*Carex distans*), Water Whorlgrass (*Catabrosa*) and rushes was the most interesting part. The Warden showed us Butterfly and Birds' nest Orchids and in the Forestry Commission plantations we found Wood Spurge (*Euphorbia amygdaloides*), Wild Service Tree (*Sorbus torminalis*) and Wayfaring tree (*Viburnum latana*).

Sewstern Lane and Saltby Heath: where part of the ground covered was in Leicestershire. The old Mere (boundary) road or Sewstern Lane is the county boundary with an excellent calcicole flora. Limestone grasses dominated the undisturbed sward and here the best plants were Purple Milk Vetch (*Astragalus danicus*), Horseshoe Vetch (*Hippocrepis*); Carline Thistle, Bee Orchid, Mignonette, Hedge Bedstraw, Dropwort and Restharrow were also found. The wild roses were in full bloom (*Rosa arvensis*, *canina* and *stylosa*) together with a few shrubs of Buckthorn (*Rhamnus catharticus*). Many thistles were seen on the disused airfield, particularly fine masses of Woolly Thistle (*Cirsium eriophorum*) and Musk Thistle (*C. nutans*) making a blaze of colour. The best plant of the day was *Fumaria vaillantii*, a new county record for Leicestershire (conf. Dr. Baker of Kew), growing with *Fumaria officinalis*.

Kirkby Moor and Waterworks: the moor was very dry and there was little to find in flower, but the waterworks ponds and woods had much of interest. Bog Pimpernel (*Anagallis tenella*) and Skullcap were seen and there were some Purple Marsh Orchids (*D. praetermissa*), Alder Buckthorn (*Frangula alnus*), Creeping Willow (*Salix repens*), Simple Burreed (*Sparganium emersum*) and sedges. Matgrass (*Nardus*) and Moorgrass (*Molinia*) were on the moor.

Epworth Turbary: a most interesting relic of peat moor has been well recorded and no new records were made. The Twigrush or Sedge (*Cladium*) must have been much more common in Lincolnshire before drainage, but Epworth and Haxey Turbaries are its last known localities. Silky Bent (*Apera spica-venti*) and Tall Bent grass (*Agrostis gigantea*) were unusual finds in an adjoining cornfield.

Potterhanworth Wood: an ancient wood on gravel, comparable to Burwell with its broad rides, overgrown saplings and new Forestry Commission plantations. Four kinds of St. John's wort (*Hypericum hirsutum*, *humifuscum*, *perforatum* and *pulchrum*) were found and also much Devil's bit Scabius (*Succisa*). By the Carr Dyke were some Small leaved Lime trees, Water Chickweed (*Myosoton*) and Purple Comfrey (*Symphytum officinale*).

Huttoft Bank: not very much to find botanically, the dunes have been repaired and fronted with a sea wall after the 1953 Storm-Flood. A little of the old dune survives, but Sea Buckthorn was scarce. Sea Rocket (*Cakile*), Sea Spurrey (*Spergularia marina*) and Sea Pearlwort (*Sagina maritima*) were seen.

Willingham Forest [Pickard's Plantation]: parts of which were birch and oak scrub, but mostly new pine woods planted twenty to thirty years ago. Four Buckler Ferns (*Dryopteris filix-mas*, *borreri*, *spinulosum* and *dilatata*), Hard Fern (*Blechnum*), Birdsfoot vetch (*Ornithopus perpusillus*), Wood and Marsh Cudweeds (*Gnaphalium uliginosum* and *sylvaticum*), Wood Groundsel (*Senecio sylvaticus*) and several Hawkweeds were seen.

Benniworth Haven: mid-October was too late for flowers round the lakes and woods. On the line of the disused railway were two Divisional records — Sticky Groundsel (*Senecio viscosus*) and Ploughmans' Spikenard (*Inula conyza*) and Wavy Hairgrass (*Deschampsia flexuosa*) and Heath Bedstraw (*Galium saxatile*) were a surprise. In the western meadow Lesser Spearwort (*Ranunculus flammula*) and Yellow sedge (*Carex demissa*) were fresh records for that square.

Vice-County Record

Galinsoga ciliata	11	M. N. Read

Divisional Records

Agrostis gigantea	1	I. Weston	*Inula conyza*	8	LNU
Buddleia davidii	14	Z. Porter	*Lathyrus nissolia*	7	Shaw
Carex vesicaria	8	LNU	*Mercurialis annua*	14	Z. Porter
Cardamine amara	10	G. S. Phillips	*Potentilla anglica*	8	E.J.G.
Desmazeria rigida	1	E.J.G.	*Saponaria*	14	Z. Porter
Erigeron canadense	1	E.J.G.	*Senecio viscosus*	8	LNU
Impatiens glandulifera	1	B. M. Howitt			

MYCOLOGY

H. J. Houghton

This year, despite its long dry spells in the summer, has proved a good one both in quantity and numbers of species. At Castor Hanglands (in Northamptonshire) in June, 14 species only were found, seven of these being rusts. The latter were on wild rose, meadowsweet, watermint, rosebay and other willow herbs, the common thistle and buckthorn. At Saltby Heath the weather was again very hot and dry, and three species only were found on the Lincolnshire side of the County boundary. However, one of these, *Ustilago hypodytes* proved to be a new County Record and one other, *U. avenae*, a new record for Division 15. Conditions were better for the Willingham Forest on the 17th September, some rainy days having preceded the meeting. Agarics were more in evidence, and 33 species were collected, consisting of those one would expect from such an area.

The fungus foray was held at Benniworth Haven, in the Wolds, where there is a mixture of very wet and very dry areas, with mixed woodland containing many dead and rotten trunks, logs, etc., and a lake. Despite the inclement weather 91 species were recorded, comprising a very mixed bag of rusts, agarics and other basidiomycetes, ascomycetes (mainly cup fungi) and myxomycetes. Six species proved to be County records and 33 were divisional records. Miss Waterhouse made her annual visit from Kew to lead the foray, and we are indeed grateful for her continued support in the County.

Recording of species by photographic means has gone on steadily during the year, and a request has been received from Scunthorpe Museum Society for assistance in making a reference collection of slides of fungi known to occur in the district. A foray organised by Scunthorpe Museum Society on the 8th October in Holme Lane Plantation, Messingham, was led by Mr. Houghton, when some 50 species were identified, six proving to be new divisional records for an already well worked area.

Specimens have been sent in this years by Mrs. J. G. Porter, Dr. M. Lubin, Mr. F. Brazier, Miss G. Schmid, Mr. G. S. Phillips, Mrs. A. D. Hallewell, Mrs. D. J. F. Adams, Mrs. D. Weston and Mr. N. Holland, producing one county record (*Phomopsis cacti* on a cactus from Mr. Holland's collection) and 29 divisional records. Thanks are due to Miss Waterhouse and her colleagues at Kew for the identification of the County record and several others.

FUNGUS FORAY, BENNIWORTH HAVEN

21st October, 1967

New records for Lincolnshire:

Lepista irina (Fr.) Bigelow
Leucocoprinus brebissonii (Godley apud Gill.) Locquin
Lentinellus cochleatus (Pers. ex Fr.) Karst.
Entoloma rhodopolium (Fr.) Kumm.
Peniophora erikssonii Boidin
Podporia confluens Karst.

New records for Division 8:

Bolbitius vittellinus (Pers. ex Fr.) Fr.
Clitocybe langei Sing. ex Hora
Clitocybe rivulosa (Pers. ex Fr.) Kumm.
Coprinus niveus (Pers. ex Fr.) Fr.
Entoloma porphyrophaeum (Fr.) Karst.
Gymnopilus penetrans (Fr. ex Fr.) Murr.
Hygrophoropsis aurantiaca var. *pallida* (Cooke) K. & R.
Laccaria amethystea (Bull. ex Mer.) Murr.
Lactarius glyciosmus (Fr. ex Fr.) Fr.
Marasmius androsaceus (L. ex Fr.) Fr.
Mycena alcalina (Fr. ex Fr.) Kumm.
M. epipterygia (Scop. ex Fr.) S. F. Gray
M. inclinata (Fr.) Quél.
M. speirea (Fr. ex Fr.) Gill.
Panaeolus sphinctrinus (Fr.) Quél.
P. subbalteatus (Berk. & Br.) Sacc.
Paxillus involutus (Batsch. ex Fr.) Fr.
Daedaleopsis confragosa (Botl. ex Fr.) Schroet.
Psathyrella hydrophila (Bull. ex Mér.) Maire
P. spadiceogrisea (Fr.) Maire
Tricholomopsis platyphylla (Pers. ex Fr.) Sing.
Xylodon versiporus (Pers.) Bond.
Merulius tremellosus (Schrad.) Fr.
Stereum rugosum (Pers.) Fr.
S. sanguinolentum (Fr.) Fr.
Lycoperdon ericetorum Pers.
Aleuria aurantia (Fr.) Fuck.
Helotium scutula (Pers.) Karst.
Humaria hemisphaerica (Wigg. ex Fr.) Fuck.
Hypoxylon fragiforme (Pers. ex Fr.) Kickx.
Scutellinia scutellata L. ex St. A.
Trichoscyphella hahniana (Seaver) Manners
Tubifera ferruginosa Quél.

Other new records for 1967

County records:

	Div.
Phomopsis cacti (Berk.) Grove	14
Ustilago hypodytes (Schlecht.) Fr. on *Zerna erecta*	6

Divisional records:

Mollisia cinerea (Batsch. ex Mér) Karst.	6
Lycoperdon pyriforme Pers.	16
Auricularia judae (Hook.) Underw.	16
Merulius tremellosus (Schrad.) Fr.	16
Flammulina velutipes (Curt. ex Fr.) Karst.	16
Dacromyces deliquescens (Bull.) Duby	16
Diatrype disciformis (Hoffm. ex Fr.) Fr.	16
Geastrum pectinatum Pers.	16
Tremella mesenterica Retz. ex Fr.	16
Mycena galopus (Pers. ex Fr.) Kumm.	16
Stropharia semiglobata (Curt. ex Fr.) Quél.	16
Psathyrella candolleana (Fr.) Maire	16
Coprinus disseminatus (Pers. ex Fr.) S. F. Gray	16
Lycoperdon perlatum Pers.	16
Ustilago avenae (Pers.) Rostr.	15
Amanita citrina (Schaeff.) S. F. Gray	5
Bolbitius vitellinus (Pers. ex Fr.) Fr.	5
Tricholoma argyraceum (Bull. ex. St. A.) Gill.	5
Typhula erythropus Fr.	5, 13
Geoglossum cookeianum Nannf.	4, 9
Peziza repanda Pers.	4
Coprinus picaceus (Bull. ex. Fr.) S. F. Gray	7
Melanoleuca melaleuca (Pers. ex Fr.) Murr.	7
Russula queletii Fr. apud Quél.	7
Boletus elegans Schum. ex Fr.	7
Mycena epipterygia (Scop. ex Fr.) S. F. Gray	7
Russula fragilis (Pers. ex Fr.) Fr.	7
Lactarius deliciosus (L. ex Fr.) S. F. Gray	7
Rhytisma acerinum (Pers. ex St. A.) Fr.	7
Otidea onotica (Pers.) Fuck.	2
Daedaleopsis confragosa (Bolt. ex Fr.) Schroet.	2
Lycoperdon ericetorum Pers.	2
Mycena alcalina (Fr. ex Fr.) Kumm.	2, 13, 16
Clitocybe fragrans (Sow. ex Fr.) Kumm.	2
Xylodon versiporus (Pers.) Bond.	13
Mycena tenerrima (Berk.) Sacc.	13
Exidia albida Huds.	13
Psathyrella hydrophila (Bull. ex Mér) Maire	13
Stereum rugosum (Pers.) Fr.	13
Mycena hiemalis (Osbeck ex Fr.) Quél.	13
Collybia dryophila. (Bull. ex Fr.) Kumm.	13

BRYOLOGY AND LICHENOLOGY

M. R. D. Seaward, m.sc., m.i.Biol.

This year I was fortunate to discover in the Natural History Museum collections at Wollaton Hall, Nottingham, some manuscripts and a limited number of lichen specimens relating to the work of the late **H. Fisher [1860-1935].** The Fisher Collection, which also includes manuscripts and herbarium material relating to Lincolnshire bryophytes, gives a very good indication of the once rich lichen and bryophyte flora of the Grantham area at the turn of this century. I have not had the opportunity to examine the bryophyte herbarium material, but if the manuscript records can be substantiated by specimens, then at least twelve new vice-county records, many divisional records, and second records of numerous Lincolnshire rarities will be added to our registers. I should like to record my thanks to the Director of the Nottingham Natural History Museum for allowing me the opportunity to examine this collection.

An account of the bryological work in Lincolnshire of the famous Yorkshire botanist **F. A. Lees [1847-1921]**, together with a comprehensive list of his Lincolnshire bryophyte herbarium material, have been published during the past year (Seaward: F. A. Lees' Lincolnshire Moss Records. *The Naturalist*, 1967, 77-80).

Lichen Check-List

The following are additions to the Lincolnshire check-list (see: *Lincs. Nat. Union Trans.*, **16,** 153-159 and 233-234); records made from the Fisher Collection (see above) are given in parentheses:

Caloplaca aurantia (Pers.) Hellb. 5, 15
C. citrina (Hoffm.) Th. Fr. 5, 6, 15
C. decipiens (Arnold) Jatta 13
C. heppiana (Müll. Arg.) Zahlbr. 5, 6
Candelariella medians (Nyl.) A.L.Sm. 5, 13, 15
Cladonia arbuscula (Wallr.) Rabenh. (9)
C. gracilis (L.) Willd. (15)
Cladonia squamosa (Scop.) Hoffm. (15)=vice-county record
Collema crispum (Huds.) Web. 5, 15
Diploschistes scruposus (Schreb.) Norm. (15)
Graphis scripta (L.) Ach. (15)
Lecanora atra (Huds.) Ach. 5, 6, 13, 15
L. calcarea (L.) Sommerf. 5, 6
L. campestris (Schaer.) Hue 5, 6
L. muralis (Schreb.) Rabenh. 5
Lecidea lucida (Ach.) Ach. 5, 6, 13, 15
L. macrocarpa (DC.) Steud. 5
Lepraria incana (L.) Ach. 14
Pertusaria amara (Ach.) Nyl. 6
Physcia adscendens (Th. Fr.) Oliv. em. Bitt. 5, 6
P. caesia (Hoffm.) Hampe 5, 6
P. grisea (Lam.) Zahlbr. 5, 15
P. orbicularis (Neck.) Poetsch 5
Placynthium nigrum (Huds.) Gray 5=vice county record, 15
Ramalina farinacea (L.) Ach. (15)
Verrucaria muralis Ach. 5, 6, 15
V. nigrescens Pers. 5
V. sphinctrina Ach. 13
Xanthoria aureola (Ach.) Erichs. 5, 6, 13

Moss Vice-County Record

154/1z. *Hypnum cupressiforme* var. *tectorum* B., S. & G. acid grassland, Risby Warren, N. Lincs. (54), August 1966, M. Seaward (*Trans. Brit. Bryol. Soc.*, **5,** 424). A robust variety with densely crowded, and slightly curved leaves, growing in association with *Peltigera* spp. amongst open grassland and scattered patches of *Calluna vulgaris* on cover sand.

BRITISH LICHEN SOCIETY 7th ANNUAL FIELD MEETING, STAMFORD 29th — 31st OCTOBER, 1965

The ten members who attended were not treated to favourable weather or a rich lichen flora, but 30 new records for vice-county, 53 were added to local registers, some useful mapping was undertaken in two 10 km. grid squares, and a better understanding of the lichen flora of a neglected corner of Britain obtained. Recording and field work were mainly concentrated in areas six to ten miles north of Stamford in grid squares 53/02 and 53/01. Soils are mainly derived from, or closely connected with, the Lincolnshire Limestone; altitudes in this area do not exceed 200 ft. Rainfall is less than 25 in. per annum. Measurements of atmospheric pollution are not

available. Although there are no extensive areas of urbanization and industrialization within a radius of 15 — 20 miles, the prevailing winds are such as to give a relatively high degree of pollution derived chiefly from the west.

Grimsthorpe Park (by kind permission of the Earl of Ancaster): Mixed deciduous woodland (grid ref. 53/02) on Kellaway Sand and Cornbrash supported the following: *Xanthoria parietina*, *Evernia prunastri*, **Physcia tenella*, *P. grisea*, **Buellia punctata*, *Parmelia sulcata* (all on poplar), *Cladonia fimbriata*, *C. coniocraea*, *Caloplaca citrina*, *Parmelia physodes*. *P. subrudecta*, **Cetraria glauca*, **Parmeliopsis ambigua*, *Pertusaria pertusa* (all on oak), *Parmelia saxatilis* (on ash), *Lecidia scalaris* (on pine), **Chaenotheca ferruginea* (on elm), **Catillaria griffithii* (on elm and sycamore), **Schismatomma decolorans* (on maple), *Physcia orbicularis* (on horse-chestnut), *Lepraria incana*, *Lecanora conizaeoides*, *L. dispersa*, **L. expallens*, **Parmelia glabratula*, *Cladonia chlorophaea*, *Buellia canescens*, *Pertusaria amara*, **Lecidea uliginosa* (on several of the above trees).

Verrucaria muralis, *V. nigrescens*, **Collema tenax*, **Protoblastenia metzleri*, *Peltigera spuria*, *Cladonia chlorophaea* and **C. subrangiformis* were found in an old limestone quarry fringed by grassland (grid ref. 53/032204), and a bridge built of limestone material nearby supported *Physcia caesia* (abundant), *Lecanora campestris*, **Candelariella aurella*, *Verucaria nigrescens*, *Caloplaca citrina* (all frequent) and *Lecanora muralis* (occasional).

Edenham: The churchyard and surrounding wall (grid ref. 53/062218) possessed a rich lichen flora. The contrasting acid and calcareous gravestones supported differing floras, and some indication of the effective powers of colonization was provided by a gravestone, almost covered by lichen thalli, that had been erected within the past fifteen years. The stone substrata provided the following species: *Caloplaca aurantia*, *C. heppiana*, *C. decipiens*, **C. teicholyta* (*c. fr.* — a rare occurrence), *C. citrina*, *Candelariella medians*, *Verrucaria nigrescens*, *Lecanora campestris*, *L. muralis*, **L. calcarea*, *L. dispersa*, *Xanthoria parietina*, *X. aureola*, *Physcia grisea*, *P. orbicularis*, *P. caesia*, *Buellia canescens*, **Placynthium nigrum*, *Lepraria incana*, *Collema crispum*, *Rinodina* cf. *teichophila* (det. Sheard), *Parmelia sulcata*, *P. glabratula*, *Physcia adscendens* — the latter three species being found on acid stone only.

A disused railway cutting near **Toft** (between Little Bytham and Lound; grid ref. 53/0718) provided a variety of habitats mainly on clay and sand embankments with the following species: *Peltigera spuria*, **Cladonia furcata*, **C. rangiformis* (fumarprotocetraric acid strain), *C. chlorophaea*, **C. subulata* (=*C. cornutoradiata*), *C. fimbriata*, *C. conista*. *Parmelia sulcata*, *Lecanora conizaeoides*, *Lepraria incana*, and *Phlyctis argena* were frequent on a young elm tree, and *Pertusaria amara* (var. *flotowiana*), *Verrucaria nigrescens*, *Caloplaca citrina*, *Xanthoria parietina*, *Protoblastenia rupestris* and *Physcia adscendens* were frequent on stonework near the cutting.

**Lecidea lucida* was recorded from an old brick wall near Stamford School Biology Laboratory, where examination of the above material was undertaken.

Old Park Wood, Irnham (by kind permission of Sir Walter Benton Jones) is a mature oak wood on boulder clay (grid ref. 53/014266): The lichen flora was disappointingly poor; only *Parmelia sulcata*, *P. physodes*, *Evernia prunastri*, *Lecanora conizaeodes* (with the fungus *Corticium centrifugum*), *Pertusaria amara*, *P. pertusa*, *Cladonia coniocraea*, *Catillaria griffithii*, **Lecanactis abietina*, *Chaenotheca ferruginea*, *Lecanora chlarotera*, *L. expallens*, **Lecidea granulosa*, *Lepraria incana* and **L. candelaris* were found, but an interesting oak fence at the edge of the wood supported *Lecidea scalaris*, *Lecanora conizaeoides*, *Cetraria glauca*, **C. chlorophylla*, *Parmelia glabratula*, *P. sulcata*, **P. tubulosa*, *Cyphelium inquinans* and *Parmeliopsis ambigua*.

A large coppice on boulder clay at **Norwood** (grid ref. 53/0325) had the locally-common *Lecanora conizaeoides-Lepraria incana* covering, although several mature trees at the margin had extensive coverings of *Evernia prunastri*, *Pertusaria amara* and *Parmelia physodes*.

Old brick walls (grid ref. 53/031239) had extensive coverings of *Lecanora dispersa*, *L. calcarea*, *L. muralis*, *L. atra*, *L. campestris*, *Xanthoria parietina*, *X. aureola*, *Physcia adscendens*, *P. orbicularis* and *Candelariella vitellina* mainly about their crumbling mortar joints.

Scottlethorpe Quarry (grid ref. 53/047203) at an Upper Lincolnshire Limestone exposure provided the following records: *Verrucaria muralis*, *V. nigrescens*, **V. viridula*, *Lecanora dispersa*, *Protoblastenia rupestris*, *Caloplaca heppiana*, *Sarcogyne regularis*.

At **Holywell** (grid ref. 53/007160) an interesting lichen flora was encountered on the limestone outcrops and in the limestone grassland. The former provided *Caloplaca heppiana*, *Lecanora campestris*, *L. dispersa*, *Physcia orbicularis*, *P. adscendens*, *P. caesia*, **Verrucaria sphinctrina* and *Protoblastenia rupestris*, and the grassland provided *Cladonia subrangiformis* (frequent), *C. rangiformis* (fumarprotocetraric acid strain) and **C. pocillum* (both scarce). A roadside rail nearby provided a suitable substratum for **Physcia dubia*, a rare lichen which has only been recorded from six other vice-counties.

In all, 67 records were made for the 10 km. grid square 53/02. Vice-county records are indicated by an asterisk. Our sincere thanks are due to Mr. and Mrs. J. H. Chandler for their assistance in much of the preparation and conducting of the meeting.

VERTEBRATE ZOOLOGY

M. Johnson, F.Z.S.

Good progress has been made with recording recently due to an increasing interest by both adult and junior members of the Union. Information obtained is supplying vital data for county records and the national distribution scheme.

MAMMALIA

Badger Survey: it is pleasing to note that the badger, in spite of continuous persecution, is still fairly common in some parts of the county. Thirty-five occupied setts have been examined to date. I would remind anyone who might like to help gather information for this survey that the location of setts given to me is regarded as confidential and will not be published in reports.

On a visit to one woodland area the discovery of a badger nest built above ground was of special interest, but it is not known if the nest had been used for breeding purposes.

Bats: visiting Sudbrooke Park on 5th March I observed a bat flying in daylight at 5-30 p.m.; after watching it visit the stream to drink I managed to net it, identify it as a *Whiskered Bat*, and release it unharmed to continue its daylight flight. On 21st May a colony of bats were discovered in the roof of a building at Reepham. Ten were netted as they emerged at dusk — eight *Pipistrelle* and two *Long-eared. Noctule Bats* have been observed in flight at North Hykeham, Doddington and Reepham.

A junior member, Frank Curtis, is investigating bat haunts in the Sudbrooke Park area and has recently added the *Natterers Bat* to the list of those found in this area.

Grey Squirrels, already common in the county, have recently put in an unwelcome appearance at the Linwood Warren Nature Reserve. A *Stoat* was seen in white 'ermine' pelage near Greetwell Farm on 23rd November. Two *Weasels*, a male and a female, were found dead, but unmarked near Fiskerton and are now preserved in Lincoln Museum.

On 9th August a nest of the *Water Vole* built above ground was found in the reeds at the side of Sudbrooke Lake. *Bank Voles* have been seen at Norton Disney Woods and in the Barlings area; their skulls have been found in owl pellets taken from Barn Owl roots at Fiskerton and Greetwell. *Lesser Shrew* skulls have been found in Barn Owl pellets from Greetwell and from a Tawny Owl pellet found in Risby Warren.

REPTILLIA

Viviparous Lizard: one seen in Barlings Pit, 7th July; many seen near Skellingthorpe Wood, 24th June. *Slow Worm:* one seen Skellingthorpe Wood, 29th July; one very young specimen seen near Greetwell Farm, 7th August. *Adder:* many records from Linwood Warren and the Market Rasen area. *Grass Snake:* many records from Linwood, Sudbrooke Park, Skellingthorpe, Doddington, Fiskerton and Reepham.

AMPHIBIA

The distribution of our amphibia in the county is a field of relatively easy research for our junior members and they have responded very well to my request for information. They have made a good start with pond survey work, and Nature Conservancy amphibia record cards are being completed as work progresses. There are three species of Newts in Britain and two of these — the *Smooth* and *Crested Newts* — are probably common enough throughout the county, but the *Palmate Newt* has not yet been discovered here.

ARACHNOLOGY

G. W. Whatmough, m.p.s.

Spiders are sent to me by members, friends and, in particular, by school children and this forms most of my work as a sectional officer. Of those which most frequently pass through my hands in any year two species above all others, *Meta segmentata* and *Tegenaria atrica* are the favourites. The latter is the largest of our commoner house-spiders, and, since we are all impressed by size, it is not very remarkable that the particularly long-legged wandering males of this species are quickly swooped on by budding araneologists of all ages. The commonest capture in the garden is that ubiquitous orb-spinner *Meta segmentata* — a spider which exhibits great variation in colour though its abdominal pattern remains fairly constant. I have known school children to send in jars full of examples of this attractive creature in a variety of shades of brown and red and green and many grades of monochrome. When told that they are all of the same species a look of disappointment followed by one of mild disbelief usually results. After this experience it is hard to explain that fifteen tiny black spiders, taken on a single stretch of garden fencing, in the course of a few minutes, represent about eight different species! I hasten to explain that half our total number of spiders — about 600 in all — are tiny black money spiders. Among the Linyphiids two species predominate locally. One of these has fine long legs and black and white bars on the abdomen and is called *Lepthyphantes tenuis*. The other is glossy black all over, has shorter, stouter legs, belongs to a different sub-family and is known as *Erigone dentipalpis*.

This year I intended to do some intensive work on a stretch of the Witham bank near Boultham Park. I had sunk a number of glass jars, to act as pitfall traps, between the river itself and the drain parallel to it. This was done in January, but by the time I was due to make a second examination of the contents the River Authority had decided to clear a great deal of the vegetation on the bank and consequently any remaining jars were buried beneath a deluge of mud and refuse dredged from the drain. Later in the year the banks were sprayed with noxious chemicals. In spite of these atrocities I was able to note a specimen of *Ero cambridgei* in litter under a gorse bush.

I would like to acknowledge the help of members in the compiliation of this report, in particular Messrs. F. Brasier and J. H. Duddington who have done useful work throughout the year, mainly in the Scunthorpe area.

List of more interesting species of the year:

Family SALTICIDAE

Salticus cingulatus (Panzer). Near relative of the common zebra spider. A female was found on Laughton Common, a new record for Division 5 and 10 km square 4389. J.H.D. This species is usually found on tree trunks while the zebra spider *S. scenicus* most frequently occurs on walls.

Sitticus pubescens (Fabr.). A male was found indoors near Lincoln by a young schoolboy.

Family LYCOSIDAE

Lycosa pullata vel *prativaga*. A female spider taken at the L.N.U. meeting at Potterhanworth wood in August showed characters mid-way between the two above species. The legs were annulated and the epigyne, while in size equal to that of *pullata* was in configuration typical of *prativaga*, though it must be noted that the abdomen ventrally was misshapen due to carrying the egg-sac.

Family AGELENIDAE

Hahnia montana (Bl.). Members of this genus are unique in having their spinners in a straight row. Although widely distributed they appear to be nowhere common in Lincolnshire. A male of the above species was found in woods on the southern boundary of R.A.F. station Swinderby by E. C. Riggall.

Family THERIDIIDAE

Steatoda bipunctata (Linn.). This is the fairly common glossy brown spider often found in the windows of garden sheds and outhouses. F. Brasier took one in his garden at Scunthorpe which was found to be carrying a tiny red mite. Both spiders and harvestspiders are known to carry mites. The host is used merely as a means of transport and is not parasitised.

Family ARGYOPIDAE

Araneus diadematus Clerck. Proof of the amount of recording still to be done in parts of the County is given by the fact that the discovery of a male Garden Spider in Roxton Wood (F.B.) provided new records both for Div. 4 and square 5411.

Singa pygmaea (Sund.). Many immature specimens of this pretty orb-spinner were found in Willingham Forest at the Union's Sunday Field Meeting in September. It is the only *Singa* now found in Lincolnshire, mature specimens should be looked for in June. It can be frequent locally.

Family LINYPHIIDAE

Dicymbium tibiale (Bl.). Both sexes at Tetford (E. C. Riggall). The 'gouty' appearance of the first tibiae of the male distinguishes this species from other members of the genus.

Entelecara erythropus (Westr.). A female found in a Scunthorpe garage (square 4480) had a less globular abdomen than normal. A new record for Div. 2 and the 10 km square, J.H.D.

Gnathonarium dentatum (Wider). A typical marsh-loving spider. A male taken at the edge of Shovelers Pool at Gibraltar Point. A welcome new record for the Reserve. It would be profitable and instructive to study the arachnid fauna of this specialised habitat at regular intervals.

Dismodicus bifrons (Bl.). Found in Kirton limestone quarry in the parish of Manton. F.B.

Micrargus herbigradus (Bl.). Has been found for the second time in Lincolnshire this year. This one was taken in February at Tetford. (E.C.R.). A new record for Div. 10 and square 5337.

Porrhomma pygmaeum (Bl.). An interesting capture by E. C. Riggall at Bassingham in May.

Bathyphantes parvulus (Westr.). A new record for Div. 2 and 10 km square 4480 (Scunthorpe F.B.). According to Locket and Millidge this spider is still regarded by some workers as a subspecies of *B. gracilis*, but local specimens appear to be fairly readily separable.

Bathyphantes nigrinus (Westr.). Both sexes found in moss at Tetford in February, E.C.R.

Drapetisca socialis (Sund.). Plentiful on tree trunks in Potterhanworth Wood in August. A few melanic specimens were noted running with normally coloured spiders.

ENTOMOLOGY

G. N. Holland, B.Sc.

Lepidoptera, 1966

It was encouraging to note that Brimstone butterflies were noted by four people (in and around Lincoln), Peacocks by four people, Red Admirals by three, and Painted Ladies by eight. Mr. R. B. Wilkinson reported at least 150 Red Admirals on 14th August, 39 Painted Ladies between 24th May and 19th September, at least 40 Meadow Browns on 14th August and a Clouded Yellow on 17th August. Dr. R. E. M. Pilcher reported several Green Hairstreaks at Gibraltar Point at the end of May. Mr. J. H. Duddington discovered 6 larvae of the Painted Lady at Twigmoor, and at Messingham on 23rd July he saw 3 Graylings, but these may disappear with extractive and agricultural development. Rev. Canon G. Houlden noted 5 male and 3 female Chalkhill Blues in their famous territory near Ancaster on 29th August, but could not find any White Admirals or Chequered Skippers at Skellingthorpe. Rear Admiral A. D. Torlesse could not find the latter in Bardney Forest either, but the White Admiral was seen by Rev. P. C. Hawker in Newball Wood on 22nd July.

A Death's-head Hawk moth was seen at a window in Sleaford in mid-July by Mrs. Whittle. A Small Elephant Hawk was noted at Gibraltar Point on 18th July by Mr. R. B. Wilkinson who also reported 2 Confused Moths (not recorded in the county since 1958) there on 18th June.

New Park Wood near Bardney was visited on the evening of 14th May by Mr. G. A. T. Jeffs, Rear Admiral A. D. Torlesse and Mr. G. N. Holland with two mercury vapour lamps. Two Lunar Marbled Browns (only recorded five times previously for the county), one Great Prominent (recorded six times previously), one Blossom Underwing (recorded five times previously, the last being 1901), one Frosted Green (recorded three times previously), one Barred Umber (last reported in the county in 1955), one Purple Thorn (only two other records) and a Small Engrailed (only third time recorded) were found.

Rear Admiral A. D. Torlesse saw the Red-green Carpet at Woodhall Spa on 20th September, only the third time this species has been noted in the county. Mr. J. H. Duddington can claim a county record for his discovery of the Chalk Carpet in a small colony at Kirton Lindsey quarries at the end of July. He also states that the White Satin Moth is back in force at Scunthorpe where it had not been reported since 1960. Two species noted by Mr. G. N. Holland were previously absent from the county records: the Mediterranean Flour Moth and the Pale Plume taken at Woolsthorpe-by-Belvoir on 2nd July.

Lepidoptera, 1967

Twenty-one species of butterflies have been recorded of the total of 78 in the British list. The excellent sunshine record for June and July must have favoured their appearance. Mr. J. H. Duddington considered that the Orange Tip was becoming more plentiful. The Gatekeeper or Hedge Brown is mentioned from four localities and the Ringlet was common along the Old Mere Road near Saltby on 8th July. Rev. Canon G. Houlden saw about 10 Speckled Woods and 10 Meadow Browns in Skellingthorpe Wood on 5th July and suggested that the latter is much less common than it used to be because the ancient meadows with their many varieties of grasses and wild flowers have been ploughed up and the temporary leys do not seem to suit it.

The highlight of the Kirkby Moor meeting on 22nd July was the appearance of at least 4 Dark Green Fritillaries feeding on thistle flowers near the waterworks. Purple Hairstreaks were reported from Kirkby Moor on 23rd July. The Common Blue was seen at Woodhall Spa, at Kirkby-on-Bain and in the quarries at Kirton Lindsey. An interesting variety of the Small Copper was taken by Mr. J. E. Bebbington at Kirkby Moor — it was asymmetrical, having fused and radiating forewing spots on the left side. There are three reports of the Chalkhill Blue near Ancaster. Large and Small Skippers have been noted and Mr. G. N. Holland saw a Dingy Skipper in the old quarry on Wilsford Heath.

Mrs. I. Weston reported several pupae of the Death's-head Hawk Moth found in a potato field at Riseholme, and 6 were similarly found at Cherry Willingham. Sixty-seven different species of moths were attracted to Mr. M. P. Gooseman's mercury vapour lamp in Mrs. McIver's garden at Holme Lane near Scunthorpe on 1st July, including Elephant Hawks, a Small Elephant Hawk and a Sallow Kitten. A moth, which is said to be less generally distributed than formerly — the White Satin — was noted as common round street lights in Scunthorpe by Mr. Duddington. At Saltfleetby dunes on 7th June numerous egg-laying Fox Moths were attracted to mercury vapour lamps. A species which is described as "apparently uncommon in the Midlands" is the Least Yellow Underwing which occurred at Boston. One Red Underwing was seen at Boston; this attractive moth seems far less common than a few decades ago.

The Flame Carpet, which is said to be more plentiful in the southern half of England, was recorded at Brumby Woods. The Sandy Carpet came to Rear Admiral A. D. Torlesse's light at Saltfleetby. The Chimney-sweep, an appropriately named Geometer, which always has a very local distribution, was seen on the Old Mere Road and in Holme Plantation. A county record can apparently be claimed by Mr. Bebbington for the one Scarce Pug which was on the sea bank at Fishtoft near Boston. He also found a melanic specimen of the Mottled Beauty on the Old Mere Road and a Grass Wave on Kirkby Moor (said to be rare on the east side of the country).

Coleoptera

The shiny black Ground Beetle (*Feronia madida*) was found on the Old Mere Road by the junior members diligently searching beneath stones; also the Devil's Coach-horse (*Staphylinus olens*) a ferocious specimen which very soon attacked and killed the former. *Rhagonycha fulva* was seen pairing at Kirkby waterworks, complete with some mites. Mr. Gooseman discovered colonies of the bright yellow 22-spot Ladybird under Burdock leaves at Huttoft Bank; 3 carrion bettles (*Thanatophibus rugosus*) were discovered by Mr. Rhodes on a dead crow strung up on a gibbet; and the Sexton Beetle (*Necrophorus investigator*) was seen.

MARINE AND FRESH WATER BIOLOGY

A note on the Freshwater Leeches [Hirudinea] of the Lincoln area

H. C. Grant, m.sc., m.i.Biol.

For the past four years I have been collecting Leeches from the Lincoln area. The collections have been made from three habitats: 1. the lake in the grounds of the Lindsey College of Agriculture at Riseholme Park; 2. the Fossdyke; and 3. the river Witham below Lincoln. The collecting has been confined to the summer months and has been by hand from aquatic vegetation and stones.

The following species have so far been identified:

Family GLOSSIPHONIDAE

Hemiclepsis marginata (Müller). Only one specimen found in the Lake at Riseholme Park. This species is a parasite of fish and possibly also of amphibians.

Glossiphonia heteroclita (Linnoeus). Found in small numbers in Riseholme Park Lake and in the Fossdyke. It is a parasite of gastropod molluscs and is said not to be found in running water.

G. complanata (Linnoeus). Another parasite of gastropod molluscs found in the Fossdyke and in the river Witham.

Helobdella stagnalis (Linnoeus). A parasite of invertebrates, gastropods and insect larvae. Relatively common in the Fossdyke.

Family ERPOBDELLIDAE

Erpobdella testacea (Savigny). This species seems to prefer still water subject to organic pollution and is not parasitic, feeding on aquatic insect larvae and small crustaceans. Found in Riseholme Park lake.

E. octoculata (Linnoeus). This species feeds in a similar manner to *E. testacea* and is found in all three habitats listed.

Trocheta subviridis (Dutrochet). One specimen found in the muddy bank of the small stream that drains from Riseholme Park lake. This species is sometimes found in garden soil as it feeds on earthworms and other small invertebrates.

REPORT OF THE HON. GENERAL SECRETARY, 1967-68

During 1967 twelve Field Meetings were held, including the first Sunday meeting for many years. A total of 648 attended, the largest number being 103 (71 adults and 32 juniors) at the Fungus Foray. Sixty per cent of members attending expressed an interest in Botany, 20% in Entomology, 10% in Ornithology and 10% had general interests. The success of the Field Meeting programme owes much to the fact that there are three Hon. Field Secretaries. The Botany Report elsewhere in this issue lists all the Field Meetings except the first which was a Dawn Chorus meeting at Wilsford Heath. Details of records made at meetings will be found in appropriate Section Reports. The meeting at Huttoft Bank was primarily to study the 'Submerged Forest', well exposed on the beach and the assemblage of glacial erratic beach stones. Meetings were planned to cover most parts of the county and to cater for most interests.

On 28th/29th October, 1967 a residential weekend course, "Birds in Autumn", tutor Mr. R. Spencer of the British Trust for Ornithology, was held at the Gibraltar Point Field Station. Organised jointly with the University of Nottingham Department of Adult Education and the Workers' Educational Association, it was limited to 15 students and was a considerable success. The winter programme opened with the November meeting to receive Section Officers' Reports, attended by fifty members. Most of the items discussed are the subject of reports in this issue. Particular mention was made of the success and extensive programme of the South Humberside Group which owes much to the drive and imagination of the local committee and its Secretary Mr. G. S. Phillips. Members from any part of the county are welcome at meetings. Later, at the Annual General Meeting on 9th March, 1968 it was possible to report a considerably increased membership due largely to nearly fifty new subscriptions in South Humberside. This gives a total membership, including junior family members, of 530 and the List of Members is published in this issue.

In December forty-five members of the Union and the Lincolnshire Trust for Nature Conservation braved terrible weather to hear Dr. M. D. Hooper and Dr. J. M. Way of the Nature Conservancy speak on "Hedgerows and Road Verges". This included how to survey a hedge and estimate its age, and a review of the increasing importance of roadside verges in the conservation of wildlife. In January, 1968 over seventy members of the Union and Trust heard Mr. K. Williamson, F.R.S.E. of the British Trust for Ornithology speak on "Bird Census work and Conservation", and another successful Photographic Section meeting was held in February.

The Executive Committee met four times during the year; one of the main matters discussed was the form of *Transactions*. As a result this issue is in a new format, with new type-face and arrangement of contents, and it is planned to give greater prominence to researches and investigations by members. It is hoped that Presidents and Secretaries of Sections will be active in promoting and stimulating work in the county.

As a result of an amendment to paragraph 7 of the Constitution passed at the 1968 Annual General Meeting, Officers of a Section are now also ex-officio members of their Section Committee. Also at the A.G.M. Mr. D. N. Robinson reported on behalf of the Union's representatives on the Council of the Lincolnshire Trust for Nature Conservation Ltd. He mentioned new reserves at Baston Fen, Red Hill and South Rauceby Warren, an increase in membership of over 400 achieved largely through film shows, and the well-produced supplement in *Lincolnshire Life*. As a result of a successful approach to the County Councils

the Trust will be able to appoint an administrative officer and strengthen the clerical assistance and field staff. Forthcoming Nature Trails to be mounted in association with Shell were referred to. The pressure on the wild places of Lincolnshire is not likely to decrease and in this respect the Union has a vital part to play in study, recording and research and we look forward to increased co-operation between the Union and the Trust.

The President-elect for 1968-69 is Dr. P. E. Kent, D.SC., PH.D., F.R.S., F.G.S. In proposing him Mr. F. T. Baker recalled his geological work in the county since the early 1930's and his work in oil exploration. One of the culminations of this work had been his collaboration with the late Professor Swinnerton in the Union's best-selling *The Geology of Lincolnshire* in 1949. Dr. Kent will be the first Fellow of the Royal Society to be President of the Union.

LIST OF MEMBERS

Letters at right indicate subject interest.

A — Arachnology
B — Botany
By — Bryology
C — Conservation
E — Entomology
FB — Freshwater Biology
G — General interest
Gy — Geology
L — Lepidoptera
M — Mammals
Mi — Microscopy
My — Mycology
O — Ornithology
P — Photography
Z — Zoology

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Harrison, Miss E. J., 15 Cambridge Av., Lincoln — *O*
Harrison, Miss E. M., 15 Cambridge Av., Lincoln — *O*
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Holland, Mrs. G., 7 St. Edmund's Rd., Sleaford
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Hollingworth, Mrs. J., 12 Conyers Av., Grimsby
Holmes, K. W., 20 Western Av., Lincoln — *G*
Holmes, Mrs. J. M., 20 Western Av., Lincoln
Horsfield, Miss A. W., High St. North Thoresby — *O*
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Hotchkin, Mrs. M., 65 Reynold St., Cleethorpes
Houghton, H. J., 7 Willingham Rd., Lea, Gainsborough — *P, My, G*
Houghton, Mrs., 7 Willingham Rd., Lea, Gainsborough — *G*
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Howitt, R. L., Farndon, Newark — *B*
Howitt, Mrs., Farndon, Newark — *B*
Hurst, J., 38 Tylton Lane East, Wyberton, Boston — *O*
Hydes, W. S., B.ENG., A.M.I.C.E., A.M.I., MUN.E., D.P.A., 24 Eastbrook Rd., Lincoln — *G*
Hydes, Mrs., 24 Eastbrook Rd., Lincoln

Inkley, N. J., B.SC.(ECON.), M.I.O.M., 'Rowans', Mount Pleasant, Holton-le-Clay — *O*
Inkley, Mrs. K. A., 'Rowans', Mount Pleasant, Holton-le-Clay — *G*

Jackson, C., 125 Ermine St., Ancaster — *O*
Jackson, P. E., M.D.B.S., M.R.C.P., M.R.C.S., 1 Empingham Rd., Stamford — *B*
Jackson, Mrs., 1 Empingham Rd., Stamford
Jackson, Miss K. M., The Old Rectory, Salmonby, — *G*
James, B. C., White Gables, High St., Gosberton — *E*
James, Mrs. P., White Gables, High St., Gosberton — *G*
JEFFS, G. A. T., F.R.E.S., The Old Vicarage, Tathwell. President, 1960-61 — *E*
Jerram, D., 16 Manor Dr., Scawby — *G*
Jones, E. R., 'Jesmondene', Scawby Brook, Brigg — *O, G*
Jones, Mrs. L., 'Jesmondene', Scawby Brook, Brigg — *O, G*
Johnson, Miss M., 20 Westminster Dr., Grimsby — *G*
Johnson, Miss V. M., 20 Westminster Dr., Grimsby — *G*
Johnson, M., F.Z.S., 11 Meadow Way, Fiskerton Road, Reepham — *G*
Jukes, C., A.R.I.C., 5 Chapel Garth, Tetney — *O, B, C*
Jukes, Mrs., 5 Chapel Garth, Tetney

Kennington, J., Church Farm, Riby — *O*
Kenny, G., B.SC., A.R.I.C., 37 Mount St., Lincoln — *G*
Kenny, Mrs., 37 Mount St., Lincoln — *G*
Kent, R., 'Woodville', Alkborough — *A*
Kitching, M., Fotherby — *O*
Knibb, Miss A. J., 15 The Grove, Lea, Gainsborough — *O*
Knight, V. H., 17 Pietermaritz St., Lincoln — *O*

Lacy, Dr. P. B., M.B., CH.B., F.R.C.S., D.R.C.O., The Croft, Reepham — *B, G*
Lacy, Mrs., The Croft, Reepham
Lammiman, F. R., 2 Marymead, Ludborough — *B, O*
Langford, Miss E., 'Hilltop', Alkborough — *B, O*
Lavington, S., 34 Vernon St., Lincoln — *G*
Laws, Miss G. M., 61 Ridgeway, Nettleham — *G*

Leahy, Miss M., B.A., 21 Minster Yard, Lincoln — *B, My*
Ling, Mrs. E., 23 Eastfield Rd., Louth — *O, B*
Lissett, Sqn. Ldr. J., 59 Lancaster Dr., Scampton — *G*
Lissett, Mrs., 59 Lancaster Dr., Scampton
Locking, G., 20 Woodsley Av., Cleethorpes — *G*
Locking, Mrs. J., 20 Woodsley Av., Cleethorpes
Long, R. J., 5 Orb Lane, Scunthorpe — *P*
Long, Mrs., 5 Orb Lane, Scunthorpe
Lowe, C. J., B.A., 84 Laceby Rd., Grimsby — *O, E*
Lowe, C. G., Denton, Grantham — *P*
Lowe, Mrs. M. A., Denton, Grantham — *B*
Lubin, Dr. M. M., M.B., B.S., 2 Curle Av., Lincoln — *B, My, C*
Lubin, Mrs. J., 2 Curle Av., Lincoln
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Macer, Dr. R. C. F., M.A., PH.D., 'The Rowans', Ashby cum Fenby — *My*
Macer, Mrs. V. G., 'The Rowans', Ashby cum Fenby — *G, B*
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Marshall, J., 66 Waterloo St., Market Rasen — *O*
Marshland, Miss F. E., 'Cedar Ridge', Marton — *B*
Mason, E., 'The Moat House', Drury Lane, Lincoln — *B. L*
Mawer, Miss M. D., Ludd Cottage, Scamblesby — *G*
MAY, R., Limber, Habrough. President, 1956-57 — *O*
McClelland, M. J., B.ENG., 55 Broadway, Lincoln — *M*
McDonald, Miss A. P., B.SC., 7 Grosvenor Cres., Grimsby — *G*
McIver, Mrs. D. G., B.A., Brackenwood, Holme, Nr. Scunthorpe — *G*
Medcalf, Mrs. A., 20 Doddington Rd., Lincoln — *O*
Mighell, J. S., 67 Sleaford Rd., Metheringham — *O*
Miller, G., 56 Queen Mary Rd., Lincoln — *O*
Mitchell, N. S. P., 7 Cringleway, Great Ponton — *B. O*
Mitchell, Mrs. D. C., 7 Cringleway, Great Ponton
Montgomery, Miss E. W., 384 Burton Rd., Lincoln — *G*
Moorcroft, W., 7 Taylors Av., Cleethorpes — *O*
Moorcroft, Mrs., 7 Taylors Av., Cleethorpes
Mooore, Mrs. F. F., PH.D., B.SC., 22 Mons Rd., Lincoln — *E, Z*
Morgan, J. R., B.SC., D.P.A., A.C.I.S., 'The Red House', Low Rd., Barrowby — *E, B, O, C*
Morgan, Mrs., 'The Red House', Low Rd., Barrowby
Morrall, Mrs. E. M., 107 Pelham Av., Grimsby — *O*

Neale, Mrs. E. F. W., J.P., Searby Manor, Barnetby — *G*
Nelstrop, Mrs. I., The Old Hall, Leadenham — *B, O*
New, T. R., B.SC., A.R.I.C., Imperial College Field Station, Silwood Park, Sunninghill, Ascot, Berks. — *E*
Newsum, G. H., 17 Mainwaring Rd., Lincoln — *O*
Nilson, Miss A. E., 'Rose Villa', The Avenue, Healing — *G*
Norman, R. K., 9 Yarra Rd., Cleethorpes — *O*
NORRIS, F., F.C.C.S., M.B.O.U., 120 Church Lane, Scunthorpe. President, 1962-64 — *M, O, C*
Norris, Mrs., 120 Church Lane, Scunthorpe — *G*

Osterfield, I., B.A., 4 Hall Yard, Burton-by-Lincoln — *O*
Osterfield, Mrs. M. J., B.A., 4 Hall Yard, Burton-by-Lincoln — *B*
Ostler, R., 36 Allington Garden, Boston — *B, O, E*
Ottaway, C. L., 36 Horncastle Rd., Louth — *O, E*

Paddison, I. J., A.R.P.S., 27 Second Av., Grimsby — *G, P*
Paddison, Mrs., 27 Second Av., Grimsby
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Palmer, Mrs. D. L., B.SC., 2 Yarborough Rd., Grimsby — *E, FB*
Parrish, E. J., 41 Nettleham Rd., Lincoln — *O*
Parrish, Mrs. G. N., 41 Nettleham Rd., Lincoln — *O*
Pass, G., 338 Grimsby Rd., Humberston — *O, B, P*
Pass, Mrs., 338 Grimsby Rd., Humberston — *O, B*
Peet, W. M., A.C.I.S., 75 Church Road South, Skegness — *O, C*
Pendegrass, W. C., 2 Broadway, Grimsby — *G*
Pendegrass, Mrs. B., 2 Broadway, Grimsby
Pepler, G. R. S., M.A., Greystones, Welton-by-Lincoln — *O*
Pepler, Mrs. C. J. M., L.R.A.M., Greystones, Welton-by-Lincoln — *B*
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Phillips, Mrs. G., 71 Pearson Rd., Cleethorpes

Pool, J. R., 'Green Mile', Vicarage Rd., Messingham — *O, G*
Poole, Mrs. M., B.Sc., 'Southmead', Washdyke Lane, Nettleham — *G*
Porter, G. R., Avenue House, Spilsby — *O, G*
Porter, Mrs., Avenue House, Spilsby
Porter, J. G., 2 The Manor House, Austerby, Bourne — *G*
Porter, Mrs. Z., 2 The Manor House, Austerby, Bourne — *B*
Posnett, G. L. A., 20 Hood St., Lincoln — *B, O*
Powell, S. R. W., B.D.S., 147 Yarborough Rd. Lincoln — *G*
Powell, Mrs., 147 Yarborough Rd., Lincoln
Power, Miss E. M., 38 Trinity Rd., Cleethorpes — *G*
Prentice, J. E., Ph.D., B.Sc., 57 Salisbury Rd., Harrow, Middx. — *Gy*
Prince, L. N., The Centurion, Newark Rd., N. Hykeham — *O, G*
Prince, P., The Centurion, Newark Rd., N. Hykeham — *O*

Quickfall, K., 50 Grimsby Rd., Cleethorpes — *G*
Quickfall, Mrs. M., 50 Grimsby Rd., Cleethorpes

Race, Mrs. R. M., F.L.S., A.M.A., 11 Curle Av., Lincoln — *B, G, C*
Read, Miss P. M., 4 Allen House, Allen St., London, W.8 — *M, B*
Read, M. H. B., Brook House, Hemingby — *O*
Reed, K. C., 67 Scotter Rd., Scunthorpe — *G*
Reed, Mrs., 67 Scotter Rd., Scunthorpe
Redshaw, E. J., 7 Fennell Rd., Pinchbeck — *O, B, Gy*
Rhodes, Mrs. F. E., 26 The Cres., Lea, Gainsborough — *B*
Rhodes, O. C., 77 Nettleham Rd., Lincoln — *B, O*
Richards, Mrs. E. M., Dip. Hort., 'Staniland', Wrawby Rd., Brigg — *G*
Rivers, Dr. J. S., M.B., B.Chir., 'The Limes', Bennington — *B, O*
Roberts, Miss L. N., A.L.A., Little Garth, High St., Scampton — *O*
Robinson, D. N., M.Sc., 160 Eastgate, Louth — *G, Gy, C*
Robinson, Mrs. J. E., B.Sc., 160 Eastgate, Louth — *G, B, C*
Robinson, K., B.A., 161 Mill Rd., Cleethorpes — *O*
Rowe, J., 14 Queensway, Lincoln — *B*
Rowe, Mrs., 14 Queensway, Lincoln
Rudd, R. A., 104 Weelsby Rd., Grimsby — *M, O*
Rudkin, Mrs. E. H., Willoughton, Gainsborough — *Gy, B, O*

Sale, Mrs. O., Archway House, Hundleby, Spilsby — *B, O*
Salt, Mrs. E., School House, Tathwell — *O, B, G*
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Scott, Dr. D. G., Stone House, Mill Lane, Heighington — *G*
Scott, Mrs., Stone House, Mill Lane, Heighington
Scott, F., A.I.F., 129 Grantham Rd., Sleaford — *B, O*
Scott, Mrs., 129 Grantham Rd., Sleaford
Seal, G. H., New Place, Willingham — *B, L*
Seaward, M. R. D., M.Sc., M.I.Biol., 16 St. Chads Av., Leeds, 6 — *B, By*
Seaward, Mrs. M., 16 St. Chads Av., Leeds, 6 — *G*
Seed, P. F., A.I.B., 7 Howlett Rd., Cleethorpes — *O*
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Shaw, Mrs., 6 Chambers Farm Cottages, Hoop Lane, Apley, Wragby
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SMITH, A. E., O.B.E., M.A., 'Pyewipes', Willoughby, Alford. President, 1968-9 — *G, C*
Smith, A. E., B.Sc., 270 London Rd., Wyberton, Boston — *L*
Smith, A. H., F.C.A., Welland House, High St., Spalding — *O, E, C*
Smith, Mrs. J. M., Gainsborough Road Garage, Scotter — *G*
Smith, J. P., A.M.I.W.P.C., The Spinney, Scothern Rd., Sudbrooke — *FB*
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Spurrier, Mrs. O. V., The Old Vicarage, Blankney — *B, O, Gy*
Stewart, Miss D. M., 'Aingarth', Wrawby Rd., Brigg — *G*
Stewart, F., 41 Holywell Rd., Lincoln — *O*
Stollery, D. G., M.A., 43 Yarborough Cres., Lincoln — *B, Gy*
Stollery, Mrs. O., 43 Yarborough Cres., Lincoln
Store, N. J., 31 Abbey Park Rd., Grimsby — *B, O*
Straw, A., B.A., Ph.D., Dept. of Geography, The University, Sheffield, 10 — *Gy*
Sumner, J., F.R.I.C., 4 Lindsey Dr., Healing — *Z, B, Gy*
Sumner, Mrs. M., 4 Lindsey Dr., Healing
Swann, E. L., 282 Wootton Rd., King's Lynn — *B*

Tallack, C. K., O.B.E., M.I.C.E., Brattleby House, Reepham *G, C*
Tallack, Mrs. V., Brattleby House, Reepham *G*
Taylor, Mrs. D., B.SC., Totmoor, Owmby-by-Spital *B*
Tear, B., B.SC., 115 Grantham Rd., Bracebridge, Heath *G, C*
Torlesse, Rear-Admiral A. D., C.B., D.S.O., Trentham, Burton Joyce, Notts. *E*
TOWNSEND, A. D., M.B.O.U., 11 Bassingham Cres., Lincoln. President, 1966-67 *O, E, C*
Towriss, J., 78 Washingborough Rd., Heighington *G*
Towriss, Mrs., 78 Washingborough Rd., Heighington
Tozer, A. R., C.Eng., A.M.I.Mech.E., A.M.I.Plant.E., 31 Malton Rd., North Hykeham *G*
Tozer, Mrs. M., 31 Malton Rd., North Hykeham *O, B*
Turner, J. T., 2 St. Peter's Grove, Scotter *O*
Tyler, Mrs. S., Top Flat, 15 High St., Lyndhurst, Hants. *G*
Twydell, C. N., B.A., B.SC., 51 Windsor Av., Grays, Essex *FB, By*

Van den Bos. S., Linbeg Nurseries, Goxhill *O*
Vaughan, R., M.A., PH.D., 102 Westbourne Av., Hull *O*

Walker, C. H., 'Lynwood', Queen St., Kirton-in-Lindsey *Gy*
Walker, L. W., B.SC., 8 Manor Close, Lincoln *B, Z*
Walker, Mrs. A. P., 8 Manor Close, Lincoln
Waldram, Miss K. G., M.B.E., J.P., 39 Abbey Rd., Grimsby *B*
Wans, Miss J., B.SC., Gloucestershire College of Education, Oxstalls Lane, Gloucester *FB, E, G*
Wardle, E., 81 Gloucester Av., Grimsby *G*
Wardle, Mrs., 81 Gloucester Av., Grimsby
Watson, Mrs. D. A., 173 Lincoln Rd., Branston *B*
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Welstead, Mrs. M. T., 8 Astley Cres., Scotter
Weston, R. P., B.SC., 4 Riseholme Lane, Lincoln *G, C*
WESTON, Mrs. I., B.SC., 4 Riseholme Lane, Lincoln. President, 1967-68 *B, C*
WHATMOUGH, G. W., M.P.S., Lindens, Gibraltar Hill, Lincoln. President, 1959-60 *A*
Whatmough, Mrs. O. B., Lindens, Gibraltar Hill, Lincoln
Wherry, A., 28 West Rd., Bourne *B*
Wherry, Mrs. K., 28 West Road, Bourne
White, Miss F. E., 26 St. Augustine Av., Grimsby *B*
Whysall, Mrs. E. W., 'Selwyn', Westend, Harlaxton *B*
Wightman, Alderman J., J.P., F.Z.S., Tathwell Hall, *O, Z*
Wilkinson, M., 'Eversley', Bridge St., Louth *G*
Wilkinson, Mrs. C., B.SC., 'Eversley', Bridge St., Louth
Wilkinson, R. B., 3 Ocean Av., Skegness *O, C*
Wilson, Miss M., The Old Rectory, Salmonby *G*
Wilson, P. J., 'Penates', Station Rd., Reepham *O, P, C*
Winslow, R. M., 31 Richmond Rd., Cleethorpes *G*
Withers, R., J.P., 119 Yarborough Rd., Lincoln *G*
Witting, Miss M., The Cottage, Beaumont Fee, Lincoln *G*
Wood, Miss M. K., B.SC., 25 The Grove, Lea, Gainsborough *G*
Wood, Mrs. J. A., 44 Bargate, Grimsby *G*
Wood, P., Wood Cottage, Woodthorpe, Alford *G, O, C*
Woodcock, E. J., 6 Welholme Av., Grimsby *G*
Woodcock, Mrs. I., 6 Welholme Av., Grimsby
Woolley, Miss E. M., 1 Riseholme Lane, Lincoln *O, G*
Wright, The Rev. D., M.A., Willoughton Vicarage, Gainsborough *G*
Wright, Mrs. D., Willoughton Vicarage, Gainsborough *O, B*
Wright, Mrs. A. M. E., Kirkby Green, Scopwick *G*

Young, W. L., B.SC., 19 Smith St., Lincoln *P, E*

Student Members

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Cosgrove, R. J., Manor Estate, Woodhall Spa *O*
East, M. R., 4 Pelham Av., Grimsby *G*
Hatch, M. J., 41 Ainslie St., Grimsby *Z*
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Junior Members

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Ellis, P. R., 63 Cromwell Rd., Cleethorpes	*O*
Francis, K., 73 Reynolds St., Cleethorpes	*O*
Gray, N. de, 382 Heneage Rd., Grimsby	*G*
Guest, R., Birchdale, Laughton Wood Corner, Scotter	*Z, M*
Hewis, R. J., Fir Tree Lodge, Church St., Scothern	*O*
Horsfall, J. A., 67 Pershore Av., Grimsby	*O, Z*
Jamieson, R., 114 Highgate, Cleethorpes	*G*
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Walenta, S. A., 'Springfield', Lincoln Rd., Dunholme	*O, M*
Whittaker, Miss J. A., 2 Constance Av., Lincoln	*O, B*
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South Park High School, Lincoln
Western Secondary Girls' School, Grimsby
Willoughby Memorial Library, Corby Glen
Wintringham Grammar School, Grimsby

STATEMENT OF ACCOUNT

from January 1st to December 31st, 1967

INCOME AND EXPENDITURE ACCOUNT

Receipts	£	s	d
To Balance at the Midland Bank, Lincoln, 1st January, 1967	114	12	4
,, Subscriptions and Donations	311	18	0
,, Sale of Books and Transactions	79	11	0
,, Interest on £500 Defence Bonds	25	0	0
,, Offprints of Presidential Address	6	10	0
,, Subscriptions 1968 in advance	92	10	0
	£630	1	4

Expenses	£	s	d
By Printing *Transactions* Vol. XVI No. 3	175	0	0
,, Duplicating and posting of notices	78	19	6
,, Subscriptions to Societies: BSBI, Council for Nature, BTO, BHS, CPRE	10	16	0
,, Income Tax on Defence Bonds	10	0	0
,, Hire of Rooms	7	14	0
,, Secretarial Expenses, 1966 (Mrs. Adams, Mr. Holland, Mr. Robinson)	8	14	10
,, Secretarial Expenses, 1967 (Mrs. Adams, Mr. Baker, Mr. Gooseman, Mr. Holland, Mr. Posnett, Mr. Robinson, Mr. Townsend)	19	9	6
,, Ornithological Conference Fee (delegate: Mr. A. D. Townsend)	3	15	0
,, South Humberside Group	5	0	0
,, Printing of Membership Cards, Membership Forms and Bankers Orders	10	11	11
,, Bank Charges and Cheque Book	1	10	6
,, Offprint Presidential Address	6	10	0
,, Cash at Bank, 31st December, 1967	292	0	1
	£630	1	4

Audited and found correct, 29th January, 1968.

ROBERT WITHERS, *Hon. Auditor.*

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Keyworth & Fry Ltd., 117-121 Portland Street
Lincoln